

1. 1. 23

590.673

.K59

ANIMAL KINGDOM

NEW YORK ZOOLOGICAL SOCIETY



VOLUME XLVII

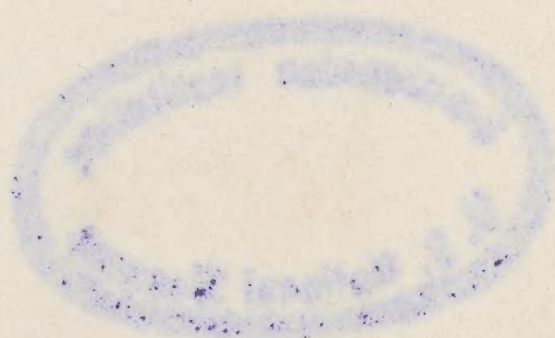
JANUARY TO DECEMBER, 1944

NUMBERS 1-6



INSTRUCTIONS TO BINDER

The 4-page signature forming the first 2 and the last 2 pages of this issue may be inserted ahead of the cover of Vol. XLVII, No. 1, in binding the volume.



CONTENTS

No. 1. JANUARY-FEBRUARY

Those Bizarre Animals from Down Under	<i>Donald Marcy</i>	3
Report from the Services	<i>Cpl. Earl Chace and Pvt. Ralph Donahue</i>	9
Living in a Germ-free World	<i>William Bridges</i>	14
Nouns of Multitudes of Animals	<i>William Beebe</i>	17
London Zoo Sees It Through	<i>L. R. Brightwell</i>	18
Behind the Scenes: News and Notes		23

No. 2. MARCH-APRIL

Genesis of a Book	<i>Fairfield Osborn</i>	27
Magna Charta of the Birds	<i>William Bridges</i>	33
Mid-Vistas of Zoo Life	<i>William Beebe</i>	37
Charles Haskins Townsend	<i>Fairfield Osborn</i>	42
Behind the Scenes: News and Notes		45

No. 3. MAY-JUNE

The Birth of a Baby Platypus	<i>David Fleay</i>	51
A Short Account of Zoological Illustration	<i>Walter J. Wilwerding</i>	70
Behind the Scenes: News and Notes		78

No. 4. JULY-AUGUST

The Poisonous Snakes of the New World	<i>Clifford H. Pope</i>	83
Progress Report on "The Pacific World" Series	<i>Fairfield Osborn</i>	91
The Cubs Are Growing Up	<i>Lee S. Crandall</i>	95
Yankee Naturalist in England	<i>Capt. William J. Hamilton, Jr.</i>	98
Capturing a Giant Anteater	<i>William H. Chippendale</i>	100
Behind the Scenes: News and Notes		104

No. 5. SEPTEMBER-OCTOBER

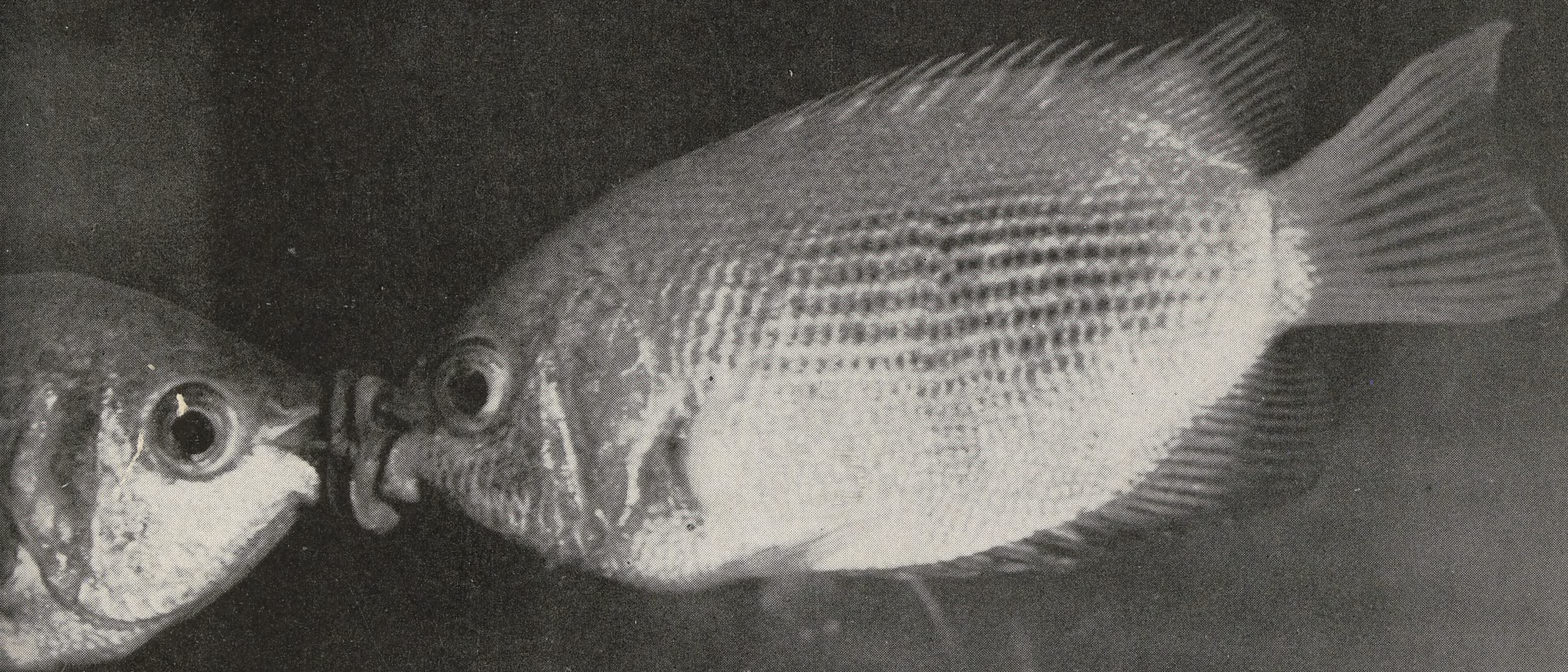
Marine Cousins of the Bears	<i>Paul Bonnot</i>	107
The Poisonous Snakes of the New World. Part 2	<i>Clifford H. Pope</i>	111
How Baby Kangaroos Get Into the Pouch		121
Fish May Be Poisonous, Too	<i>Ross F. Nigrelli</i>	122
Behind the Scenes: News and Notes		125

No. 6. NOVEMBER-DECEMBER

Government Refuges Are Saving the Trumpeter Swan	<i>Jean Delacour</i>	131
The Ape Colony in Florida	<i>Henry W. Nissen</i>	137
The Poisonous Snakes of the New World. Part 3	<i>Clifford H. Pope</i>	143
Behind the Scenes: News and Notes		153
Index to Volume XLVII		154

0.673
459

ANIMAL KINGDOM



BULLETIN, PUBLISHED BY
NEW YORK ZOOLOGICAL SOCIETY

LETTERS FROM SOLDIERS ABOUT ANIMAL LIFE • LONDON ZOO AND THE WAR
R. Brightwell • BIZARRE ANIMALS OF AUSTRALIA, Donald Marcy • NOTES AND NEWS

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York 20, N. Y.

PRESIDENT

Fairfield Osborn

FIRST VICE-PRESIDENT

Alfred Ely

SECOND VICE-PRESIDENT

Laurance S. Rockefeller

SECRETARY

Harold J. O'Connell

TREASURER

Cornelius R. Agnew

EXECUTIVE COMMITTEE

Fairfield Osborn, *Chairman*

Cornelius R. Agnew
Alfred Ely
Marshall Field

De Forest Grant
Warren Kinney

William De Forest Manice
David H. McAlpin

Robert Moses
Laurance S. Rockefeller

BOARD OF TRUSTEES

Class of 1944

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez

De Forest Grant
Eugene Holman
Warren Kinney

Henry R. Luce
William De Forest Manice
Harold J. O'Connell

Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1945

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely

Marshall Field
Childs Frick
Archer M. Huntington

David H. McAlpin
John H. H. Phipps

Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Class of 1946

George Gordon Battle
George C. Clark
F. Trubee Davison

Jay Downer
Robert I. Gannon

Robert Gordon McKay
Fairfield Osborn

Laurance S. Rockefeller
John M. Schiff
Frederic C. Walcott

Ex-officio, The City of New York

The Mayor, Hon. Fiorello H. LaGuardia

Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

John Tee-Van *Executive Secretary*

Jean Delacour *Technical Adviser*
William Bridges *Editor & Curator, Publications*
Sanford Miles *Comptroller*

Claude W. Leister *Curator, Education*
Donald Marcy *Associate, Education*
Millward W. Heath *Supt., Construction & Maintenance*

ZOOLOGICAL PARK

Lee S. Crandall . *General Curator & Curator of Birds*
Claude W. Leister *Associate, Mammals*
John Tee-Van *Associate, Reptiles*
W. Reid Blair *Director Emeritus*
William Beebe *Honorary Curator, Birds*

Leonard J. Goss *Veterinarian*
Harry C. Raven *Associate, Anatomy*
Grace Davall *Assistant to General Curator*

AQUARIUM

Christopher W. Coates *Curator and Aquarist*
Ross F. Nigrelli *Pathologist*
Myron Gordon *Assistant Curator*
Charles H. Townsend *Director Emeritus*

C. M. Breder, Jr. . *Research Associate in Ichthyology*
George M. Smith . *Research Associate in Pathology*
Homer W. Smith . *Research Associate in Physiology*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*

Jocelyn Crane *Research Zoologist*
George Swanson *Staff Artist*

Henry Fleming *Entomologist*

Associates

William K. Gregory
John Tee-Van

Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

VOL. XLVII FEBRUARY 9, 1944 No. 1

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York 20, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York 60, N. Y. Title registered with United States Patent Office.
Subscription, \$1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

Post-Mortem

"Post-Mortem" is scarcely the appropriate word for a review of such a lively affair as our recent annual Members' Meeting. As a matter of fact, it is our hope that the recollection of the meeting will continue to live, for a while, at least, in the minds of those who attended it. For a reason that we ourselves do not quite grasp, the attendance was the largest that the Society has ever had on this occasion. Further, some of the matters reported there appear to have been of such general public interest that they were made the subject of editorials in several of the newspapers.

It seems evident that many people in these parlous and critical times turn with relief to Nature. Comment was made in a previous issue on an impression we gained at the Zoo this year, namely, that the public who came there seemed to be finding unusual enjoyment. This and the apparent success of the Members' Meeting are all of one pattern — with human affairs in such a pass, the works of Nature refresh and fortify. Come better days again, we need anticipate no lag; in fact, the carrying out of the we need anticipate no lag; in fact, the carrying out of the many many new developments now being planned for the future should assure ever-increasing public attention.

Fairfield Osborn

IN THIS ISSUE

Kissing Gouramis	Sam Dunton	COVER
Those Bizarre Animals from Down Under . .	Donald Marcy	3
Report from the Services . Cpl. E. Chase & Pvt. R. Donahue		9
Living in a Germ-free World	William Bridges	14
Nouns of Multitudes of Animals	William Beebe	17
London Zoo See It Through	L. R. Brightwell	18
Behind the Scenes: News and Notes		23

SHOP TALK

A MISCELLANY of Zoo news that doesn't seem to fit anywhere else:

* * * *The Gray Fox in the Hospital is a gift. An Italian farmer brought him from upstate. Something had been killing his chickens, he set a trap, caught the fox.*

"He's in fine condition," says the Veterinarian. "What've you been feeding him?"

"He eat the sphagett—lotsa sphaggett. Slop like for the pigs, too."

Sphagetti and garbage! The Vet says he never saw a better fox!

* * * *See by the papers San Diego Zoo has lost Ngagi, its big Gorilla. Mbongo died in 1942.*

* * * *Visitors can't figure out why we built only half a wall in the rhinoceros stalls—and such low walls, too. Well, they aren't walls, to begin with. Just low concrete barriers through the center of the stalls, with room at either end for the keeper to slip past in case the rhinos charge or try any funny business.*

* * * *We've got a climbing elephant. One of our young Indians has a bad habit of pushing her trunk through the bars and swaying it in people's faces. So the engineer rigged up crossbars to limit her trunk. They made a fine ladder and she started climbing. Got three feet off the ground, too.*

* * * *But that's nothing. We've got a biting rhinoceros. Rhinos don't bite—they attack with their horns. But Betsy, the big Indian rhino, is always trying to sneak up on her keeper and literally put the bite on him.*

* * * *Two 3-foot alligators got into a fight the other day and a keeper separated them. He won't lose his thumb, but it was a close thing.*

* * * *The panda babies are picking up weight again—the male touched 179 pounds last month, the female 267 pounds. Have to quit calling them "babies" pretty soon.*

* * * *Prospective subscriber to ANIMAL KINGDOM: "Dear Sir," said his postcard. "Please send me all information about animals."—EDITOR.*



Those Bizar

Captain Cook did *not* cover the Kangaroo, Kangaroo babies are born in the maternal po

Truly a giant is the Great Red Kangaroo, for it is the height of a tall man—more than six feet—when it stands erect. This species is the largest of the 129 forms in the family, and its size is particularly impressive when it is compared with the Musk Kangaroo, which is scarcely larger than a rabbit. The barren interior plains of Australia are the home of the Giant Red.

Animals from Down Under

By DONALD MARCY

There are many true and fascinating facts about this familiar yet unpopular animal from the continent on the other side of the world.

PROBABLY NO ANIMAL has received more attention from cartoonists and humorists than the kangaroo, that bizarre animal from the Land Down Under—and all because kangaroo babies are fortunate enough to spend the early part of their lives in a fur-lined baby carriage!

To the majority of Zoo visitors, the pouch in which the young are carried is the most characteristic thing about kangaroos; indeed, zoologists have named the large and varied group to which they belong “marsupials,” from the Latin *mar-supium* (pouch).

A baby kangaroo is born in the usual manner of mammals, nearly always one at a time. Hardly more than an inch long and weighing about one three-thousandths of its mother's weight,* it is in a very premature state of development. The hind legs, eventually to become so long and powerful, are now little more than buds, and the tail is likewise small. The forelimbs, however, are well developed. They are equipped with claws by means of which the naked mite, resembling a little red grub, swims with an overhand stroke through a forest of hair into the mother's abdominal pouch. Here it fastens so tightly to a nipple that it is impossible to remove it without causing injury. In fact, it was long believed that the baby grew on the nipple, like fruit on a tree!

As the baby grows, its attachment becomes less strong, and in the Bronx Zoo when a two-months-old baby kangaroo was accidentally dislodged from the pouch it finally came loose after

* For comparison: a new-born bear weighs approximately 1/400th of its mother's weight; a human baby 1/20th; and a porcupine, 1/12th.

dangling for some time. The mother took no notice of the helpless infant, and it was necessary for the keepers to replace the baby in the pouch and force the nipple into its mouth. The baby suffered no ill effects and grew to maturity.

At first a baby kangaroo, though strong enough to have climbed into the pouch and fastened itself to a nipple, is not able to nurse. The mother forces milk down its throat by contractions of her abdominal muscles until the young marsupial develops the strength necessary to obtain milk by its own efforts.

By the time it is three or four months old or even older (the time varies in different species), the baby is covered with soft fur and pokes its head out of the pouch to look around and nibble grass while its mother feeds. Gradually “Joey,” as it is called by Australians, learns to venture forth and hop along beside its mother, always sticking close to her in order to push its head into the pouch for a refreshing drink of milk or to dive headlong inside in response to the mother's soft, chirping danger signal.

There is no set time for young kangaroos to be born, as is the case in the deer family; they may appear at any time. In the southern part of Australia, however, they are usually born in April, remaining in the pouch during the cold months (June, July and August).

A description of a kangaroo is hardly necessary, for everyone is familiar with the small forelimbs, long, powerful hind legs and muscular tail. All are adaptations to its queer method of locomotion. Actually, the incongruity of the kangaroo's figure is not so much due to the small forelimbs as it is to the enormous enlargement of the entire posterior portion of the body. If the outline of a mammal of normal proportions such as an opossum is superimposed upon the outline of the kangaroo, the truth of this statement will be evident.

An interesting feature of the kangaroo is the

peculiar development of the long, narrow hind feet. The first digit, corresponding to our "big toe," is completely missing; the second and third digits are extremely slender and are united by a common skin; the fourth digit is enormously enlarged; and the fifth is medium sized.

A kangaroo in a hurry progresses in a series of long, graceful hops upon the hind legs with the forelimbs folded and the heavy tail helping to maintain balance. Neither forefeet nor tail touch the ground. In full flight jumps of more than twenty-five feet are made, though at slower speeds the hops are short—about five feet. A group or "mob" of 'roos are said to present a stirring spectacle as they leap up and go bounding away from an intruder, the fleet females (does) leading and the old males or "boomers" bringing up the rear. Rocks, gullies and fences are cleared with ease and their speed and endurance are so great that dogs and even horses may be outdistanced.

If actually brought to bay a courageous fight may be expected. Propped firmly by its strong tail, often with its back to a tree, a cornered kangaroo strikes out and scratches expertly with its forefeet and awaits a chance to deal a slashing blow with the spear-like claws of the hind feet. Though naturally timid and characteristically wearing a gentle expression, the kangaroo must be respected as a dangerous antagonist. And when an alarmed kangaroo begins to growl like a dog, it is well to take warning and make a judicious retreat!

Kangaroos are strong swimmers and have often been known to take to the water to escape pursuit; if attacked by a dog in the water, they sometimes grasp the dog with the forepaws and hold it under water until it drowns. It is said that a hard-pressed female will sometimes remove her Joey from her pouch to increase her chances for escape, returning when danger has passed.

Traveling slowly, as when grazing, a kangaroo lifts its hind legs clear of the ground and swings them forward together while the weight of the body is supported by the forelimbs and tail. The latter practically serves as a fifth leg and is constantly used as a prop when the animal is sitting on its hind legs or standing "on tip-toe" to obtain a better view of the surrounding country. When resting, a kangaroo often turns the tail forward between the legs and sits upon it.

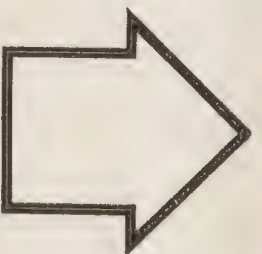
During the day kangaroos usually lie up in a comfortable spot to rest, sleep and take dust-baths in circular holes in the ground. Sometimes the males amuse themselves by sparring and grappling with one another, displaying considerable natural skill. Now and then "boxing kangaroos" are exhibited on the stage, and one owner of such an animal sued the city of Minneapolis when his kangaroo died as the result of tail injuries received in an elevator. The owner claimed that he had taken great pains and had gone to much trouble and expense to train his animal in the noble art of boxing, and should therefore be paid well for his great loss. Mr. Harry Raven of the American Museum of Natural History, an expert on Australian animal life, was called as a witness and proved that kangaroos "box" even without training. The kangaroo owner lost his case.

It is popularly believed that the kangaroo first became known to civilized man when Captain Cook, who visited Australia in 1770, described an animal that jumped "like a Hare or Deer." Ac-

Weights up to 200 pounds have been recorded for the Gray Kangaroo, a species common in the open forest areas over most of the continent. This is a species very often seen in zoological parks.



Here the silhouette (solid black) of a common American marsupial, the Opossum, has been superimposed on an outline of a Kangaroo to test the author's contention that it is the enormous enlargement of the Kangaroo's posterior that gives it such an incongruous appearance. The forward portions correspond reasonably well with those of the "normal" opossum.



tually the Dutch navigator Pelsart gave the first account of a kangaroo about 150 years earlier, in 1629. "We found large numbers of a species of cats," he wrote, "which are very strange creatures; they are about the size of a hare, head resembling the head of a civet-cat; the forepaws are very short, about the length of a finger, on which the animal has five small nails or fingers, resembling those of a monkey's forepaw. Its two hind legs, on the contrary, are upwards of half an ell [one ell equals 45 inches] in length, and it walks on these only, on the flat of the heavy part of the leg, so that it does not run fast. Its tail is very long, like that of a long-tailed monkey; if it eats, it sits on its hind legs, and clutches its food with its forepaws, just like a squirrel or monkey." The writer was evidently referring to one of the smaller kangaroos, or wallabies. Many years passed by before the complete story of these fascinating pouch-bearing mammals was brought to light.

We now know that marsupials are the dominant form of mammalian life in Australia and the adjacent islands. Furthermore, they are found

nowhere else in the world except in South America and North America, where their role is a minor one. This is indeed a strange situation. How did it come about?

Although Australia is now separated from nearby islands and other continents by water, this condition did not always prevail. In fact, not only was Australia once connected by land to nearby islands and Asia, but there are evidences that it was joined to South America as well by way of the Antarctic. We know, too, that Asia was linked to North America in the Bering Sea region. Consequently it was possible for animals to pass freely from one continent to another.

It is believed that marsupials originated in the northern hemisphere and migrated to the southern land masses. When Australia was isolated from the rest of the world by water, its marsupials were left practically free of outside influences—free from the competition of other mammals which, as the ages rolled by, evolved into the many forms of higher, more efficiently organized animals we know today. The marsupials branched out independently of the higher





Several species of Kangaroos are agile climbers, so much so that they are known as Tree Kangaroos. This is Bennett's Tree Kangaroo, a form that we have often exhibited. The tops of cages and corrals must be covered, for otherwise the animals would climb out and leap for the nearest trees. The long, slender tail is a useful balancing appendage when the Kangaroo is feeding in the tree tops; it does not have grasping power, nor does the animal use it as a prop while on the ground as the other, ground-dwelling, Kangaroos use their tails.



Australia is a continent of vastly varied terrain, and almost every type of land—plains, forested areas, rocky hillsides—has one or more kinds of Kangaroos that find those particular conditions favorable. The Black-faced Kangaroo is a dweller in the densely thicketed areas. This, again, is a species that is generally to be found in the Zoo.

mammals to fill the various habitat niches. Thus, in Australia we find marsupials that live on the open plains like our more familiar grazing animals; marsupials that burrow in the ground like moles or gophers; marsupials that live in trees and resemble flying squirrels; still others that are carnivorous and resemble large dogs; and so on. The superficial resemblance of different kinds of marsupials to various higher mammals was immediately recognized by Australia's European immigrants, for they promptly named the animals "cats," "bears," "mice," etc., after the mammals with which they were familiar in the land of their birth.

In the western hemisphere the marsupials were not isolated from the higher mammals, met stiffer competition, and consequently form but an insignificant part of the animal life of North and South America.

The kangaroo family contains about 129 liv-

ing species and sub-species, varying in size from the great red kangaroo dwelling on the interior plains, to the tiny musk kangaroo, no larger than a rabbit, which inhabits the tropical rain forests of Queensland. Typical kangaroos are large and have narrow feet. Among these, beside the great red kangaroo (which has an overall length of ten feet), are the gray kangaroo, weighing up to 200 pounds, found in the open forests over most of the continent; the black-faced kangaroo, dwelling in densely thicketed areas; and the shaggy wallaroo, which is most at home on rocky hillsides. These larger forms tend to be gregarious, frequently associating in mobs of a dozen or more.

The numerous species of smaller kangaroos or wallabies are less gregarious than the larger forms, usually being seen alone or in pairs. Their small size makes them good prey for the great wedge-tailed eagles, the introduced foxes and the dingoes; consequently they take advantage

of all available cover. The brush wallabies are at home in dense scrub jungle, while the agile rock wallabies are capable of passing over the roughest terrain at a good clip when pursued.

Up a tree is the last place you would expect to find a kangaroo, but one group of marsupials—the tree kangaroos—are perfectly at home high above the ground. Their adaptations to an arboreal existence include strong, sharp claws, roughened foot-pads, and forelimbs that are relatively longer than those of the “normal” kangaroos. Capable of ascending high trees to obtain food and escape pursuit, they often leap to the ground from a height of twenty feet, and it is claimed that one was seen to jump from the unbelievable height of sixty feet! In my opinion the tree from which this animal leaped was the last tree it climbed.

While kangaroos and wallabies are preyed upon by various carnivores, their most dangerous

predator is man. Native Australian “black men” have always hunted them, not only for their flesh as food, but for the skins to make clothing, the leg-bones to make needles, and the tendons to make thread. White men with modern weapons annually hunt down vast numbers for “sport” and for their pelts, which yield fine fur and leather. In spite of this none of the species appears to be in danger of becoming extinct, although their numbers have been much reduced.

Our kangaroos are fed oats, carrots, potatoes, apples, cabbage and bread, a diet which apparently fulfills their needs as well as do the grasses and leaves of their native land. They usually eat sitting on their hind legs, propped up by the tail and holding the food in their forepaws. Even Emily Post could not criticize their table manners, for they eat in a quiet, leisurely fashion, often taking four hours to empty the tray.

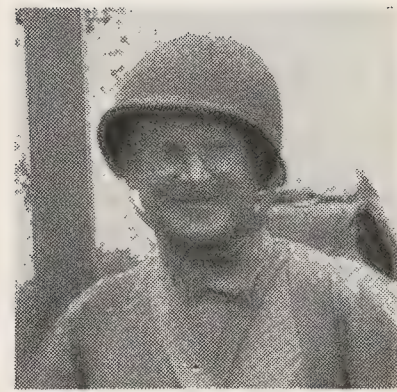


Some of the smaller Kangaroos are known as Wallabies—a fact that often inspires visitors to say: “The label says it’s a Wallaby, but it certainly looks like a Kangaroo!” This is a Black Swamp-wallaby, with its “Joey” in the pouch.



CPL. EARL CHASE

Report from the **S E R V I C E S**



PVT. RALPH DONAHUE

[The three letters reproduced here have come from members of our Armed Forces in the Pacific—but at almost opposite ends of that vast area. Cpl. Earl Chase, formerly a keeper in the Reptile House at the Zoological Park, has been stationed in India for some months; Pvt. Ralph Donahue, a friend of Dr. William Beebe, is, as his letter indicates, “somewhere in the Aleutians.”

[Both young men were keenly interested in animal life before they began their travels and both have been making good use of their eyes

and their opportunities. So must thousands of others who have found themselves caught up by the war and set down in lands where “zoo animals” are familiar, everyday, backyard fauna. In these and other letters from service men that we have seen, there is a deep curiosity and a desire to know more about the animals and plants of their new surroundings, and it is for them that “The Pacific World,” and its supplementary handbooks, mentioned by Mr. Osborn in our previous issue, are particularly intended.—
EDITOR].

Cpl. Chase Wishes He Could Exhibit An Indian Pond in the Zoo

Somewhere in India
October 14, 1943

Dear Mr. Tee-Van:

Have you ever seen a frog that can hop for about 10 feet across open water? I see one almost every day. He is a large green frog and quite often, for no apparent reason, he starts jumping violently. This action brings him out on the surface and off he goes amid much splashing. He does it quickly, too; usually you see only the marks where he hit the water, about a foot apart, then the final ring where he plunged back in.

Another interesting little rascal I see almost every day is a tiny kingfisher. He sits up about four inches, is a deep blue-greenish color, with a light robin's egg blue running down the middle of his back. His long beak and a portion of his face are oxblood red. These are quite tame little

fellows and allow me to approach within ten feet before they take off. I see them dive into the water and they always catch one of the tiny multi-colored fish that range the surface.

If I could transport one of these small ponds, its entire contents, and about ten feet of the surrounding soil with plants, back to New York, and with a wire cage around it, and set it in the Park, you would have a grand exhibit!

Imagine about eight varieties of tiny, highly colored fish, besides Elodea, hornwort, water hyacinth with a purple bloom and an eight-inch spike of flowers. Ten-inch lily pads, and six- to eight-inch red and white, or pink, water lilies. Lilies looking like giant amaryllis growing around the banks. Bamboo clusters—not small stems as in the Reptile House at the Zoo—but with six- to eight-inch butts. Tall coconut palms



Such a jungle pond as this Corporal Chase would like to transplant in the Zoological Park, although the actual pond he has been observing when he wrote his vivid description of Indian flora and fauna seems to have been even more luxuriant than the one shown here. Unfortunately, the New York climate does not lend itself to tropical pond planting.

loaded with fruit, betelnut palms in fruit, and many other tall and short varieties of palms which I do not know. Banyan trees with their many trunks, banana trees in bearing. Several varieties of duckweed on the water, large and small frogs and fish, land and water snakes, far more colorful than those of the United States.

In this transplanted pond exhibit, imagine many vines and creepers trailing from the trees, and often bearing beautiful flowers of all colors and sizes. Tiny kingfishers would be sitting on

an old limb ready to snare a meal; possibly a mongoose sneaking around the edges. A basilisk running out from under a coconut husk to a safer retreat. Several skinks burrowing under rotten palm fronds. Snipe and herons wading around the edges and finally one house crow making a racket as he scratches on the ground, and a nice smelly, bare-necked vulture trying to maintain his balance on the top of a shade tree.

To make it look real, a big, black, skinny, water buffalo with a rope through his nostrils

should be somewhere in the water, with only his nose out, and a large bluish Brahma cow with a floppy hump, a dirty belly and legs, and an amazing lot of rib showing, should be munching grass near an eight-foot cactus in the background.

The natives say these places contain big, bad, cobras also, but I still have seen none. Oh, yes, beautiful, split-tailed, green swallows should whip across the pond occasionally and grab off a few insects, and the air immediately above the water must be filled with many species of dragon and damsel flies.

The old massive banyan tree really should

have a few immense vines with large green, red and white leaves, climbing away up and threatening to choke it. A few air plants will have to adorn the branches, and every root cane must be filled with dancing crane flies.

There is much more, but I have no books or equipment with which to make identifications and even forget many names or how to spell them. It is really too bad to be among such material and just to look and, too often, forget.

Sincerely,

EARL

Pvt. Donahue Finds Plenty of Life in the Barren Aleutians

Somewhere in the Aleutians
October 18, 1943

Dear Dr. Beebe:

Received your letter of October 1st away out here in the Pacific Ocean. Instead of being in the South Pacific, I am just the opposite—out on the Aleutian chain.

At Kodiak, Alaska, we had some trees, but out here there is not a single shrub to be seen, much less a tree. There is, however, a dwarf tree-like plant¹ that grows in the deep moss of the tundra, its scanty leaves protruding through the foot-deep mossy carpet (two of its leaves, now frost nipped, are enclosed). The stalk is weak and grows from the soil, branching in several directions to enable its leaves to seek the light.

The entire island is covered with a variety of mosses that, in their collective capacity, makes for weary walking. At every step one's foot sinks down all the way from six inches to three times that. It's like trying to walk on a deep feather mattress.

There can be found, in most sections, three distinct varieties of moss. Enclosed you will find fragments of all three. The branchy brown one² grows in such compact bunches that mounds of it seem to be pushed upward in the middle, resembling large gopher hills, or Texas red ant mounds. Between these hummocks grows the green type,³ often sporting wine-colored berries

about the size of blackberries (specimen enclosed). Also enclosed is a sample of the gray moss⁴ that competes for existence with the others.

There are certain swampy areas—though goodness knows the whole terrain is boggy—where acres of "Alaskan cotton" grows. These sections, now that fall has browned the supporting stems and grassy leaves, look as though a field of daisies were in bloom (from a distance away, of course).

From evidence found in the browned seedpods and dead stalks, lupines, monks' hood, fleabane, cinquefoil, wild geraniums, and terrestrial orchids bloom here, and it can well be imagined that the country is quite beautiful in the summer.

Went on a hike this morning—the first liberty I have had since taking over here, for weeks. I had been wondering what the place would be like away from the noise and rush of camp.

First I flushed a bird that I believe to have been a male ptarmigan.⁵ As with the other creatures on the island, never before in contact with man's blood-lust of killing, this bird showed no fear of me. It merely ran ahead of me about five paces, sat down on its feathered legs and toes, and watched me with black beady eyes. Its underside was white; its back a greenish-brown, pencilled in white lines. Over each eye was a bright red crescent. I watched the creature for some minutes, then walked toward it to see it rise and fly in characteristic prairie-chicken-like flight. Later on this bird will be snow white except for

its eyes, beak, and part of its tail (if it is a ptarmigan).

Next I saw two great bald eagles⁶ standing by the edge of one of the many shallow ponds (more about the ponds and their formation in a follow-up letter). First thought them to be men seated at the lake edge fishing, the whites of their heads appearing from the distance to be white faces. They let me get within 300 yards before they lifted their great wings and slowly went up the draw, like hunting redtails or marsh hawks. Before my hike was over I had counted 16 different eagles, fully a third in their adult plumage. (To settle a bet, is the Bald Eagle's head any less feathered when it's white than when it's brown? I contend that the color is the only difference).

While in a hideaway, watching the eagles, a falcon-like bird⁷ came and hovered over my hiding place. It swung about in a great circle and came back to look five different times. Evidently it took me for some game. It was about the size of the sharp-shinned hawk at home, but was a brownish-gray, with darker tails, square ended and tipped with white.

Along the beach, among the water-ground boulders, dozens of small wrens⁸ were seen. They seemed to be after some sort of beach insects under the rocks. The birds flushed before me as I walked, like grasshoppers from an early autumn Kansas alfalfa field. They were about the size and shape of the common house wren at home, yet were more the coloration of the Carolina wren, even to the white line over the eye.

There were to be found, too, many large sparrow-like birds,⁹ brownish, with white spots over each eye, and on either side of their chins. They were shaped like the Harris sparrow at home. They sang short, sweet notes even when in the spray of the breakers.

Herring gulls¹⁰ are not at all common here, but the ravens¹¹ are everywhere, taking the place of blackbirds at home. They come right into camp to pick up bits of garbage. I know of no birds that seem so to enjoy flying. Sometimes they actually do a complete side roll; often two of them in one downward swoop.

There are birds that come through here in small flocks that look something like the Java sparrow, but many times larger. They are stout

birds¹² and their twitter and flight reminds me of that of the common bluebird. Their stout beaks are reddish and they have (some of them) a peculiar cheek hooding of a lighter hue, and on the buff bodies they have many spots and lines. They are about as erratic as cedar waxwings.

The only animals on the islands are Arctic blue foxes,¹³ but there are hundreds of them. Being tame, they are not difficult to capture and when caught make no attempt to bite. Their fur is the softest, silkiest blue color imaginable. Sometimes the animals come out of their dens and bark at you as you go by.

It's all so charming, this finding the wild not wild, but it will be only a short time until man will show his superiority in blasting these trusting creatures, both bird and animal. Already the carcasses of eagles, ravens, seals and foxes are to be found—targets for thoughtless men with rifles.

More in a following letter.

Sincerely,

RALPH

Extracts from a Second Donahue Letter "Somewhere in the Aleutians"

October 31, 1943

Recently a member of this outfit, being obsessed with a yen for hunting, went out and brought in a female Mallard Duck,¹⁴ two small Green-winged Teal¹⁵ and a beautiful Blue Goose.¹⁶ Its upper head and neck were white; the upper mandible pink, the lower black, as was its throat down to the smoke grey of its breast and underparts; its back was a blue grey with the longer feathers outlined in darker. Its webbed feet were orange yellow. It was two feet long and forty-four inches in wing spread. The crops contained seaweed, moss and grass.

About the surface of this island appear shallow lakes, really ponds, some forty acres in extent, many smaller, none more than eight feet in depth. The water is clear and sweet yet they have no visible inlet or outlet. Seepage through the tundra-covered soil seems the only explanation. I wondered what life, if any, lived in these peculiar bodies of water, and by digging a trench I emptied one small pond into a natural ravine that led into the sea.

As the water went down we found a nineteen-inch speckled trout and one ten inches long. The larger fish seemed a typical trout yet its lower jaw was upcurved like a "Humpie" in spawning season.¹⁷ The small minnows varied in size from a half inch to three inches. They had backs of light brown, bellies of honey hue, and vertical lateral lines, large eyes and large pectoral fins.¹⁸ Part of the fry had horns, two in number, about one-quarter of an inch long, extending outward and backward from just below their gills. On the back were three spines in the fin, and when captured they protested by blowing out their bodies until they seemed about to burst.¹⁹

Other creatures in the lake were small water bugs like those in my lily pond at home. Also sand-flea-like creatures. In digging the ditch we saw almost no signs of life, nothing but brown spiders, a few stink-bugs, and small slender millipedes.

While we are talking of soil and digging I might mention that an archaeological friend and

I have been digging into some old kitchen middens and camp sites of ancient Aleut villages. We found tons of sea shells, sea urchin armor, fish, whale and seal bones and those of water fowl. Mixed in all this debris, we found objects of old Aleut art; ivory spear heads, barbed and polished bone instruments, whale oil lamps of stone and other articles.

RALPH

A Note by Dr. Beebe on the Aleutian Flora and Fauna

Names can be given with reasonable assurance to the specimens and to most of the descriptions of the plants and animals seen by Pvt. Donahue, so I have added a list of these. Dr. Ernst Mayr, Dr. H. A. Gleason and Dr. L. P. Schultz have helped with some of the knottier identifications.—W. BEEBE.

Footnote:

1. Some species of Arctic dwarf willow, *Salix*.
2. This Arctic moss is *Rhytidiadelphus loreus*.
3. Crowberry or Heathberry, *Empetrum nigrum*.



New York Botanical Garden

Across forbidding plains and hills like these Private Donahue probably made the hikes that resulted in his correspondence with Dr. Beebe. This particular scene is at Karluk, Alaska, near the beginning of the Aleutian chain of islands.

4. Reindeer "Moss" or more correctly Lichen, *Cladonia rangiferina*.
5. This is either the Kiska Rock Ptarmigan, *Lagopus mutus townsendi*, or the Attu bird, *L. m. evermanni*.
6. Northern Bald Eagle; *Haliaeetus leucocephalus washingtoniensis*.
7. Probably the Western Pigeon Hawk, *Falco columbarius bendirei*.
8. Either the Kiska Winter Wren, *Troglodytes troglodytes kiskensis*, or the Attu bird, *T. t. meligerus*, according to which island is the source of the letter.
9. Aleutian Savanna Sparrow, *Passerculus s. sandwichensis*.
10. Siberian Herring Gull, *Larus argentatus vegae*.
11. Northern Raven, *Corvus corax principalis*.
12. Alaskan Lapland Longspur, *Calcarius lapponicus alascensis*.
13. A form of the Arctic Fox which does not turn white in winter, *Alopex lagopus beringensis*.
14. Mallard Duck, *Anas p. platyrhynchos*.
15. European Green-wing Teal, *Anas c. crecca*.
16. Emperor Goose, *Philacte canagica*.
17. Cutthroat Steelhead Trout, *Salmo clarkii*.
18. Cottus "Minnows," *Cottus aleuticus* (?).

LIVING in a Germ-free World

By WILLIAM BRIDGES

IT IS A COMMONPLACE of general knowledge that all life is surrounded by and pervaded by "germs." Anybody who doesn't know that elementary fact has only to read the advertisements of antiseptics in the subway. Only—it isn't completely, 100% true. There are exceptions.

In a few laboratories over the country living organisms, some of them as complex as fish, guineapigs and chickens, exist under absolutely sterile conditions. No bacteria on or in them, no fungi, no protozoa, no "germs." To all intents and purposes, they were sealed in a cellophane bag at birth and the contaminating world has been shut out ever since.

It is, as might be supposed, a peculiar sort of life and not at all what we human beings would be likely to choose for ourselves, even if it seemed to guarantee a sort of immortality. Writers of pseudo-science have sometimes dreamed of germ-free individuals able to live forever because no disease organisms could attack them. That sort of thing is all very well for those who like that sort of thing, but the fact is that freedom from micro-organisms does not mean freedom from death.

Not long ago Drs. Nigrelli and Gordon of the Aquarium staff visited the laboratories of Drs.

James A. Baker and M. S. Ferguson of the Rockefeller Institute for Medical Research at Princeton, New Jersey, and were shown a series of milk bottles, each containing pair of vigorous little Mexican platyfish. One bottle seemed to have been skimmed in the allocation of occupants; only one fish was swimming in the crystal-clear water.

Then they saw a second one, bright-eyed and fresh but lying on its side in the bottom of the bottle. They called Dr. Baker's attention to it.

"One of your fish seems to be in trouble."

He glanced at the bottle. "Oh, that one. Yes, he died two weeks ago."

So they do die—but because of the perfect sterility of their surroundings and their own bodies, decomposition does not take place as it does in other organisms.

The interest of the Aquarium men in the technique of producing and maintaining animals under perfectly sterile conditions arises from a series of experiments undertaken in the Aquarium some time ago. Diet and nutrition are, obviously, of great importance in the maintenance of a collection of fishes and far less is known about the factors involved in fish nutrition than about the dietary problems of most other ani-



From the sterile interior of the mother's body, the embryo platyfish are surgically removed a few hours before they would normally be born.

ABOVE are some of the embryos in a dish of warm water, immediately after being removed. They are about twice life size; the globular mass is the yolk sac, and the black dots are the eyes.

RIGHT are the sterile milk bottles, the future axenic homes of the germ-free baby platyfish.



imals. They set out to learn what they could and very soon discovered that no positive results could be obtained as long as bacteria were present. Fishes could easily be kept in filtered pond water and fed doses of prepared food known to contain exact quantities of minerals, vitamins, salts and the like. But it was impossible to exercise an absolute control over the fishes' intake, because bacteria were present and under certain conditions they are known to have the power to create, or synthesize, vitamins out of material existing in pond water.

At this point the Aquarium's interests coincided with those of Dr. Baker, who had been working on fish tuberculosis. Some years ago Dr. Gordon had suggested the use of fish for tuberculosis studies and subsequently the Rockefeller men used these same fish—Mexican platys—for their experiments in sterile rearing, for they were hardy, easily obtained and brought forth living young.

Their discoveries were reported eventually in the *Proceedings of the Society for Experimental Biology and Medicine* (51: 112-119, 1942), in a paper entitled "Growth of the Platyfish (*Platypoecilus maculatus*) Free from Bacteria and other Microorganisms."

That explanatory phrase, "free from bacteria and other microorganisms," seemed unnecessarily cumbersome for daily use, so they sought the advice of Dr. A. G. Johnson of the Classics Department of Princeton University. Obliging he created a new word for them: *axenic*. It filled the bill nicely: *a* means "without," or "free from," and *xenos* refers to "stranger" or "foreign life."

Drs. Baker and Ferguson did not need to wait until the baby platyfish were born in order to create an environment free from all contaminants. Embryo fish, like embryo mammals, are already in a sterile environment when they are in the mother's body. Consequently the research men developed a technique for performing a Caesarian operation under strictly aseptic conditions and removing the axenic babies a few days short of the normal four-week term of gestation. They were immediately placed in an "incubator" which was merely a covered glass dish of warm, oxygenated, sterilized water. Here the baby platys remained for several days until their yolk-sacs were absorbed, and then they were transferred

to more commodious quarters in a series of sterile milk bottles, in sterilized water.

Eventually, of course, outside food had to be provided—and that food had to be sterile, too. Dried, prepared fish food that could be sterilized was part of the answer to the problem, but living food was desirable, and so as a supplement Drs. Baker and Ferguson began to use axenic nematode worms. These roundworms (*Neoaplectana glaseri*) were, incidentally, cultivated at the Rockefeller Institute for the control of the Japanese beetle; the worm parasitizes and kills the beetle.

The research men were able to rear the platyfish to an age of four months, by which time they had attained apparently mature size. But they failed to breed. They were, it seems, sterile in a double sense.

This sexual sterility has been a stumbling block to other scientists who have experimented with the maintenance of life under aseptic conditions. With some of the protozoa, with nematode worms, insects and crustaceans they have been able to rear and breed successive generations in a condition of axenia, but it is to be noted that all these animals were invertebrates. The story is different when it concerns creatures with backbones.

At the University of Notre Dame Dr. J. A. Reynier has tried to rear axenic guineapigs and chickens and has been fairly successful in bringing them to mature size, but he has failed to bring them to functional sexual maturity.

As a matter of fact, many scientists have insisted that life in the higher organisms, including man, is impossible without the right kind of intestinal microbes. Probably no one will ever attempt to rear a human baby under axenic conditions to find out. Anyway, there are still plenty of things to find out about axenic fish—and some of them Drs. Nigrelli and Gordon hope to discover in the Aquarium laboratory.

When Drs. Baker and Ferguson added living nematodes to the diet of their fish, they undoubtedly made a great improvement on the simpler diet of prepared, sterilized food. Nevertheless, it was inadequate to some of the needs of the fish, for they did not breed. It is possible that larger living quarters and more light should be given to the fish, for there may be psychological and physiological conditioning against repro-

duction in cramped and artificially lighted quarters.

If faulty diet is indeed one of the reasons why the axenic platyfish do not breed, the Aquarium men believe it will prove possible to approximate a normal, open-water diet by providing a chain of living food reared in pure cultures—in other words, feeding the axenic platys at all stages of their growth on axenic food appropriate to those stages—plus ordinary, sterilized dried fish food.

Very young fish should be given algae in fresh form. This could be done by preparing pure

cultures of *Chlorella* or some other algae; it is possible to grow these in media composed entirely of inorganic chemicals so that all bacteria, fungi and protozoa are screened out.

At a later stage of the babies' growth it would be normal for them to feed on *Daphnia*, the familiar little organism of pond waters. Axenic *Daphnia* can be "fattened" on axenic *Chlorella* and made ready for the hungry mouths of the axenic platys. Algae-fed *Daphnia* *should* supply plenty of vitamins to the platys and—perhaps—bring them to sexual maturity.

Nouns of Multitudes of Animals

By WILLIAM BEEBE

In our Zoo we find carefully planned and executed labels which give us the names, both common and scientific, of every species of animal, bird, reptile and fish on exhibition. When several individual creatures, perhaps ten or twenty or more, are associated together we must find another name, and so we have come to speak of a herd of deer, a flock of birds or a school of fish.

When once we begin to think of such associations, curiosity prompts a search into past literature, and a very interesting thing comes to light: that one of the very first books ever printed in English contained a long and fascinating list of these nouns of multitude, some of them strange and obsolete, others still in use. The authoress was an English lady born about five hundred and fifty-six years ago. Dame Juliana Berners or Barnes wrote a good deal or all of *The Boke of St. Albans*, which dealt with hawking, hunting and heraldry, and was originally published in 1486, six years before Columbus discovered America. This volume was one of the first done in English, and was printed from an old, worn-out font of type discarded by Caxton. Ten years later, in London, it was reprinted from the same type, by a man with the delightful name of Wynkyn de Worde.

Dame Juliana spent her youth at court and became proficient at field sports, and later in life having retired from the world at Sopwell Nunnery, and finding plenty of leisure in the cloister after being raised to the position of prioress, she

began writing of the sports of her younger days. In her volume we find the following list of names of aggregations of animals, or as Miladie Barnes penned it, "the companyes of bestys and foules."

A herd of swans, cranes, curlews and wrens; a nye of pheasants; a bevy of quails; a sedge of herons and bitterns; a sorde or suit of mallards; a muster of peacocks; a walk of snites (snipe); an exalting of larks; a charm of goldfinches; a flight of doves; an unkindness of ravens; a clattering of choughs; a dissimulation of birds; a bevy of conies; a couple of spaniels; a trip of hares; a gaggle of geese; a brood of hens; a badelyng of ducks; a covey of partridges; a spring of teals; a desert of lapwings; a fall of woodcocks; a congregation of plover; a covert of coots; a dole of turtles (doves); a tygendis of pies; a flight of swallows; a building of rooks; a murmuration of stares (starlings); a nest of rabbits.

Other Nouns of Multitude taken from other authors, are:

A mute of hounds; a pack of grouse; a school of whales; a rookery of penguins and seals; a shoal of mackerel and herring; a skulk of foxes; a skein of ducks; a swarm of bees and locusts; a host of sparrows; a watch of nightingales; a dopping of sheldrakes; a lepe of leopards; an herd of hartes and bucks; a bevy of roes; a sloth of bears; a singular of boars; a dryft of tame swine; a route of wolves; a harras of horses; a rag of colts; a stud of mares; a pace of asses; a team of oxen; a drove of kine; a flock of sheep; a tribe of goats; a cete of badgers; a richness of martens; a fesynes of ferrets; a huske or downe of hares; a clowder of cats; a kendel of kittens; a shrewdness of apes; a labour of moles; a litter of whelps; a cowardice of curs; a cast of hawks; a gang of elks; a troop of monkeys; a band of horses; a pack of wolves; a run of fish; a wisp of snipe; a pride of lions; a stand of plover; a hill of ruffs; a leash of bucks; a knob of pochards; a troop of kangaroos; a string of race horses; a sussuration of sparrows; a mumble of moles; and a pop of weasels!

London Zoo

By L. R. BRIGHTWELL

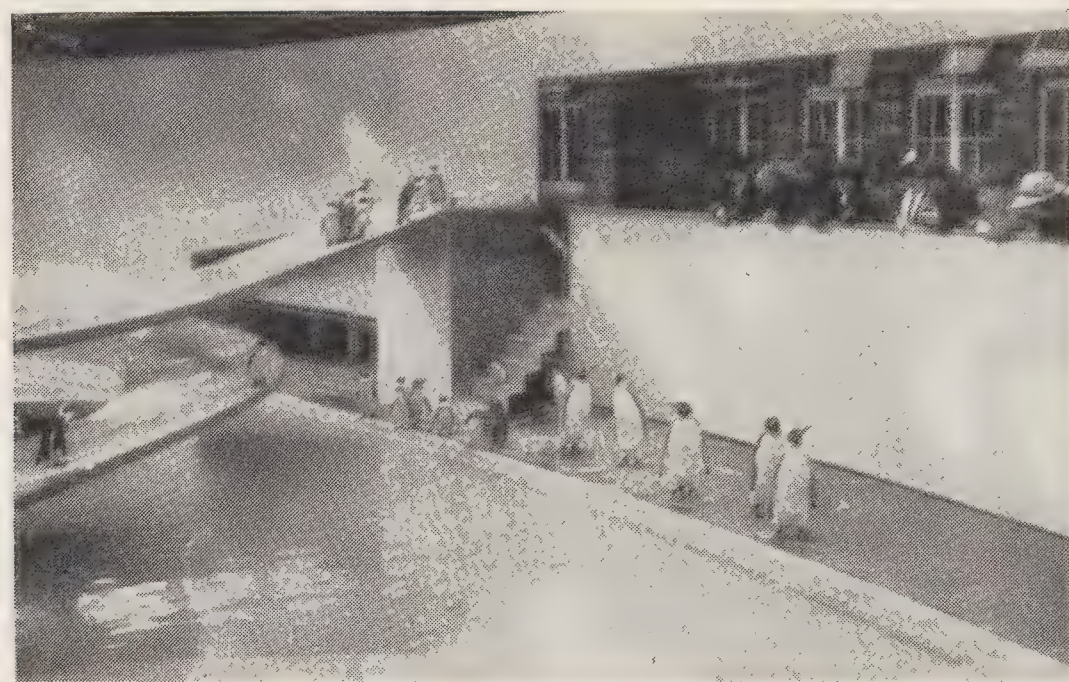
FOREWORD BY JEAN DELACOUR

The London and the New York Zoological Societies have long been closely connected. I do not think that I can be contradicted if I venture to state that, when our Society was founded some fifty years ago, the men who drafted her by-laws were mainly inspired by those of the much older English sister institution. Moreover, a number of our first keepers came from London, bringing with them to America a tradition and an experience of capital value.

Quite unexpectedly, I am now contributing to the tightening of these old ties. The incredible circumstances of the last four years have compelled me to leave my old home, and my collections have been brutally destroyed. I have found a new haven in New York. Today, the collections of the Zoological Park have replaced, in the interest that I am taking in them, my own. For many years, also, I have been a member of the Council of the London Zoological Society, the only non-Britisher ever to hold such an enviable and honorable position. Thanks to the kindness of my colleagues, I retain it even today.

In his article, Mr. Brightwell is giving us an eye-witness account of the war-time London Zoo. Every one of his lines recalls to my memory some detail of those gardens which I knew as well as my own estate. To his thrilling picture I can add a few notes that, as a trustee, have come to me. Owing to the very dark days of 1941, financial problems of the deepest gravity were added to other anxieties of the London Zoo. Only the

This article copyrighted by, and permission to reprint must be obtained from, the author.



Sees It Through

tenacity and farsightedness of the president, the Earl of Onslow, of the Treasurer, Major A. Pam, and of several of my colleagues, particularly Mr. Henry Maurice, the present president, Mr. Spedan Lewis and Mr. Alfred Ezra, joined to the generosity of some members, enabled the institution to survive. Since this difficult period, the position has been steadily improving. Mr. Brightwell gives us comforting figures of attendance to which I can add more recent news extracted from the Council Agenda for December 15, 1943, without, I hope, breaking its "private and confidential" character. The gate receipts of the London Zoo have increased by 30% over those of 1942. Once again these eminently satisfactory results show that Zoological Gardens retain their tremendous appeal to the public even under the most adverse circumstances.

A lesson perhaps may be drawn from such facts. It seems that by some unusual luck, the London Zoo and its country branch of Whipnade have suffered comparatively little from the intense bombing. Practically no animals were killed. Now we hear that the Berlin Zoo has been very hard hit, many of its inmates having been killed, others let loose and slaughtered by the police, then eaten. The Berlin garden contained a strikingly fine collection. It is a matter of great regret to all naturalists and animal lovers to hear of its destruction, particularly of the distress of the innocent victims.

I cannot forget, however, that thousands of my own birds and park animals had been deliberately killed in June, 1940, by the German invaders, who first purposely bombed and machine-gunned

them from the sky. Later on they shot them deliberately, introducing into this garden of Eden that was Clères savage dogs to hunt and kill defenceless creatures which for twenty years had been so fondly cared for by their English curator. I cannot, therefore, help seeing some sign of providential intervention in the fact that the London Zoo has survived many frightful attacks, while the Berlin garden seems to have been irremediably damaged.

London Zoo Was Ready for the Breaking of the Storm

A MERICAN VISITORS to the London Zoo (second oldest in the world) increase daily . . . and they miss the elephants.

We all miss the elephants, though apart from them the place has weathered over four years of global war better than many imagine. For accounts of the Zoo's baptism, at times a bath, of fire, are scrappy and conflicting; a jumble of fact and rumour. Here for the first time is a straight, and largely eye-witness account, of just what *did* take place.

On September 3, 1939, a year of uneasy speculation came to an end, and the Zoo awoke with the rest of us to stark realities. A rain of bombs was expected forthwith. Evacuation of persons and property went forward at high pressure. The Zoo in compliance with a Government order covering all places where people might congregate, closed. Every newssheet in the land announced the fact. It made a hot headline. Unfortunately they all . . . save the Field and Evening Standard . . . were too engrossed with other matters to announce the reopening a fortnight later. Some people *still* believe it shut!

I was privileged to come and go at will during the "black fortnight," when it always seemed to be Christmas, the only day of the year on which the Zoo closes. The local rats, normally in evidence only at night, swaggered about the deserted paths with reckless braggadocio; it was a hushed, uncanny place, but busy. The unrivalled collection of poisonous snakes was, rightly or wrongly, abolished. All glass houses save the Tortoise and Bird Houses were emptied, and the North Garden, giving onto a main road, was cleared and closed. Last touches were put to shelters and dugouts, the library of 100,000 vol-

umes was spirited away underground, elephants and giant panda left for Whipsnade thirty-odd miles away, and nearly seventy-five percent. of the staff vanished in answer to the call-up. The chief librarian, the curator of mammals and birds, and the resident assistant superintendant had already retired on pension, and their posts could not be refilled; the curator of reptiles and fishes was summoned to the War Office. Dr. G. M. Ververs, with a handful of helpers from office and works departments, five overseers and a few head keepers, were left to face whatever was in store.

Battening down for the coming storm went on apace. The Children's Zoo closed, the extensive laboratories over the Reptile House became emergency offices, the art school a general repository, and a branch of the public services requisitioned two-thirds of the restaurant, with kitchens complete. The Monkey Hill, a large rockery, was cleared. The Aquarium, highlight of the Zoo and praised by King George Vth as "the finest show in London," was emptied of everything it contained, from the valuable manatees to the last drop of water. This was a heart-breaking business—apart from the sheer labour. The work devolved on Overseer Vinal, with only Keeper Skinner of the Tortoise House to help. All marine fishes, turtles etc. went to museums . . . or the frying pan. Cold and tropical fresh water exhibits, many hundreds of them, were quite miraculously tucked away in tubs, ponds, water carts—in anything that would hold them—and almost as many were taken over from the Brighton Aquarium, now an army depot. Also the precious sea water, brought at great cost from the Bay of Biscay, was run off into storage tanks (150,000 gals.), and is still serviceable. Under the Superintendent, ARP, Fire and First Aid Services were kept at a high level.

In 1940 the storm burst. Every approach to the Zoo had its quota of death and wholesale destruction. London was the City of Dreadful Night. For weeks on end Dr. Ververs and his little band of helpers worked, ate and slept with scarcely a change of clothes. Some hundreds of bombs fell upon the Zoo's thirty-five acres, densely crowded with buildings, paddocks and rockeries. Their detonations were largely drowned in the barrage and the crash of falling London. Early in the Blitz the North Gate disappeared, the Tropic

HE'S BACK! AT THE ZOO



TO SEE THE "OFF THE RATION" EXHIBITION (AUGUST & SEPTEMBER)
AND YOU

SPONSORED BY THE MINISTRIES OF AGRICULTURE, FOOD AND INFORMATION
FILM SHOWS, DEMONSTRATIONS & TALKS BY WELL-KNOWN PERSONALITIES

This poster, in black and white, appeared all over London when the Giant Panda returned from Whipsnade. All the newspapers announced the Zoo's closing, but few took the trouble to report its re-opening!

and Rodent Houses became heaps of splintered glass, and a third of Monkey Hill, all steel girders and reinforced concrete, converted into rubble. Among scores of "incidents" may be mentioned the crashing of an incendiary bomb through the roof of the crowded Bird House, which is under the care of Overseer Jim Bailey (already known, I believe, to the New York Zoo). The bomb flared gaily on the floor of the central Tropical Finch

cage, then skated through the wire, dashed once around the house, and then made its exit through a second cage and a door marked "Staff Only." And not even a feather was signed! That was a lively night, too, when a H.E. turned the Zebra House into matchwood and gave three of its highly strung inmates a chance—and they took it—to stampede down shop-lined Park Street, Camden Town. They came back, haltered,

quietly enough. Less lucky was a Barbary sheep on the Mappin Terrace, struck dead by a shell splinter. It was the London Zoo's only casualty, and received favorable notice in the restaurant.

By this time whole areas of London lay flattened. But, now prepared for anything, the Zoo's motto like London's was "business as usual." The bombing went on, but the animals, excusably nervy at first, soon became almost indifferent to mere noise. Even peaceful Whipsnade received several hundred bombs, but the Zoo's 800-acre country branch sustained only one loss, a young giraffe, from shell shock. Mr. Schorno, the Zoo's ingenious caterer, lavished all his skill on the giraffe, but it was deemed inferior to Barbary sheep.

With no desire to overstrain the national trumpet, the writer suggests that those who run the Zoo are, like other Londoners, tolerably resilient. A local humorist lost no time in placing a crude placard by the demolished North gate . . . ZOO NOW OPEN. News of the Zoo's resumed operation was crowded out of most newspapers by world happenings, so the Zoological Society's publicity officer, Mr. G. R. Doubleday, at once placarded tubes and buses with posters, miniaturized by the paper famine, and commissioned a series of humorous lantern slides for display during the intermission at all the great Variety houses. He combined Zoo affairs with his duties as a part time instructor in the Air Training Corps, and inaugurated, as during the first World War, a series of Home Front Agricultural and Live Stock exhibitions specially designed to aid the thousands of small holders called into being by the war. Sponsored by H. M. Ministries of Agriculture and Information, and incorporating hundreds of clubs and societies, these exhibitions have attained gigantic proportions, overflowing the big central lawn that once saw the uncrating of the beasts previously kept for so long in the Tower of London. Nor was the Society's purely scientific side allowed to suffer. Even through the worst of the bombing, its rooms were at the disposal of the various societies accustomed to use them. Mr. Henry G. Maurice, the President, kept alive the Society for the Preservation of the Fauna of the Empire, and Colonel A. E. Hamerton, Prosector, with his assistants Messrs. Lawrence and Corbett, have

continued daily their postmortem work, making many valuable contributions to veterinary science and general pathology. The Society's scientific publications continue under the care of the Hon. Secretary, Professor Sheffield A. Neave, C.M.G., O.B.E., M.A., D.Sc. All things considered, the temporary fall in Fellowships¹ was not severe.

A happy inspiration of the Blitz days was the adoption scheme, whereby admirers of any particular exhibit might give their regard practical expression by paying for its upkeep. As a result scarlet "Adopted for Duration" labels now give quite a touch of colour to the gardens on the darkest day. Another wartime innovation was the installment of "educational slot machines." It was argued that if animals might be fed by automatic devices, why not the human mind? Accordingly the writer, with Mr. Fraser Brunner of the British Museum staff² and Mr. J. Noble of Pathé Films, devised machines which for a small coin showed abyssal fishes and fireflies illuminated apparently by their natural light organs (an immediate appeal to a blacked-out city) and a cinema show which explained in cartoon form how the bird evolved wings, the horse its hoofs, the elephant its trunk, etc., etc. On busy days visitors queue up for "a penny a peep," and the revenue has been appreciable. For most of the year, also, the pleasure traffic (ponies, camels, llamas), the bar and the elephants are as busy as in peace time.

Few outsiders, however, can appreciate the difficulties which London's Zoo, happy though shabby, has had to face. New York, we hope, can still get some sub-tropic fruits by overland or air. London can get none worth mentioning. And the fish supply . . . anyone conversant with Zoo-keeping can picture how some exhibits are placed. Even so, such almost irreplaceable treasures as the giant panda, the okapi, the maned wolf, the Philippine monkey-eating eagle and the birds of paradise were never in better health. And history has not repeated itself in the Lion House. The first German bid for world ownership in 1914-18 brought the lions down to a diet of dogs which, served minus heads and hides, the public happily decided were rabbits. This war of petrol

¹ The London Zoo's normal Fellowship is about 8,000.

² Much of the National Natural History Museum's Collection has been hidden in a series of caves.

permits a normal lion diet of horse flesh, though amusingly enough Zoo lions were originally fed on prime beef!

As for the staff, despite the infiltration of one or two women and small boys, head keepers and overseers largely have to do their own housemaid and stable work in addition to their ordinary duties.

Just how the Zoo sank, and rose again, confronted by such terrific odds, may be fairly gathered from the following figures.

VISITORS				
1938	1939	1940	1941	1942
1,816,012	1,707,443	631,671	502,966	1,344,568
ANIMALS EXHIBITED				
<i>(other than fishes or invertebrates)</i>				
3,801	3,624	2,932	1,574	1,752

These figures tell a tale indeed; still the struggle towards something like recovery is unmistakable. "Stay put" holidays plus a huge floating wartime population materially aid the gate. Another great step forward is the reinstatement of the Aquarium. The large cold freshwater hall is now pre-war, despite one bomb bursting on the premises, wrecking curator's office and vestibule. Steps are on foot to reopen the marine section though here the difficulties are greater. Our oldest, and headquarters, Fisheries Research Station suffered cruelly, her boats requisitioned, aquarium quite destroyed, director's house and private library demolished, and her laboratories largely wrecked. More than ever are the Zoo's dead animals in demand. Most go to reinstate the two hundred years old College of Surgeons museum, utterly destroyed in 1941. The Fire Brigade rears pigs amongst its ruins. Amazing indeed to think such witless havoc should be wrought by a nation that all but monopolised the animal trade and circus business, and blazed the trail for the modern zoo movement³ which seeks to present animals without too apparent barriers!

Our many country and provincial zoos have all ridden the storm with varying success; Lon-

³ Carl Hagenbeck first devised the Terrace—with concealed moat—in preference to bars.

don, the centre of enemy hatred, could scarcely expect to escape the worst. She certainly received it.

To the staff and old habitués, her scars are all too apparent. Fuel and service economy, for example, have dictated an amount of "chumming in" that recalls the Zoo of 1842. Never before, in his Fellowship of thirty-eight years, has the writer seen bears, let alone a maned wolf and giant panda, under the same roof as the lions; or douroucoulis, galagos, ant-bears and fruit bats in the Reptile House. The domestic rabbit, by the way, holds a place of unprecedented importance in the national economy; probably about 40% of the population can for the time being be considered rabbit fans. At the Zoo almost every house, and even the Prosectorium, can show some rabbits, either in back quarters or quite openly in cages once occupied by much rarer exhibits. This reaches a grimly humorous climax in the Reptile House where chinchillas and havanahs may be seen placidly munching cabbage against gorgeous tropical backgrounds that once set off their arch-foes—snakes.⁴ In summer the agricultural show features a long series of cages occupied each week by the star exhibits of a different rabbit club.

In the early part of the last century, Sir Stamford Raffles, founder of Singapore, set out from that port with a shipload of animals intended to form the nucleus of the London Zoo. Ship and cargo were burnt within sight of land, the crew and passengers escaping only with their lives. Wholly undaunted, Raffles, the ex-office boy turned empire builder, made a second attempt, and this time achieved his darling wish. One likes to think that incident was in some sort prophetic; that here once more history may repeat itself, and that our Zoo may indeed rise from her ashes, as has the great city that surrounds her, twice before!

⁴ The London Zoo, like all other menageries in this country, is at the moment almost wholly reliant on creatures born in the menageries to replace losses. Of late, however, soldiers on leave from Africa have presented Chamaeleons—favourite pets with our troops—as in the last war. A few regimental mascots also have been left with the Zoo for safe keeping.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

Owls Are Moving Again

By LEE S. CRANDALL

The movements of northern owls in winter are curious and apparently unpredictable. As yet, no definite causes have been established and we can still do no better by way of explanation than to speak in a general way of food scarcities and severe weather in the North country. Much work in this field is being done and some day we shall have a better understanding. In the meantime, we can only marvel that during some winters, often very moderate ones, we are inundated with owls. Not, perhaps, to an extent generally noticeable, but a Zoo's telephones and correspondence files are particularly sensitive to changes in the local fauna. Ever since October, 1943, letters and telephone calls concerning owls have been so numerous that only a thoroughly experienced secretary-assistant could have avoided being completely swamped.

This is not a time when eaters of meat—or anything else, for that matter—are welcomed by us, unless their rarity is out of the ordinary. Saw-whet, Screech, Barred and Horned Owls have been reported from all over our area, including most parts of the City itself, in very unusual numbers. People have reported them on fire escapes, in garages, bedrooms and shops. Usually, we are asked to come and catch them; invariably, the gasoline shortage has been a convenient excuse for not exhibiting our inability to do the impossible. Easy to catch though an owl in daytime may seem to be, actually he is extremely elusive. Only when the garage door is closed or the window slammed just in time, is a capture certain. With so many birds about, in unfamiliar surroundings, agile citizens are bound to outwit one now and then, so that in the first few months of the present winter, several owls of at least four species have been added to our collection.

Only once have we been directly concerned in a capture and that was purely accidental. A marauder of some sort had killed and eaten a goose in a Zoo paddock during a night in December.

There was no snow and the frozen ground held no trace of tracks, so we could only guess the villain's identity. We decided that it must be a Raccoon. A large wire box-trap, so constructed as to catch without injury any small creature entering it, was baited with the remains of the victim and set at the scene of the crime. Nothing happened for two nights but on the third morning, a sleepy Opossum was found curled up in the trap. He could have been responsible, but just on the chance that he wasn't, the trap was re-set. Two days later, Head Keeper George Scott of the Bird Department was amazed to find that a large and fierce Horned Owl had been caught. How such a bird could have found its way into a trap we have been unable to understand—the fact that he was there ruins any explanation so far advanced.

Having had so much success, Head Keeper Scott continued his efforts but nearly two weeks elapsed before the trap was sprung again, this time by a simply immense male Raccoon. Any of these creatures could have killed our goose—which one did, we shall never know. But we do know that even the sophisticated and supposedly overpopulated Bronx can yield a varied bag to the skillful and persistent trapper.

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since the last issue of this magazine are the following:

Founders in Perpetuity

Cornelius R. Agnew	Alfred Ely
Templeton Crocker	Archer M. Huntington

Fellows

Dr. H. A. Charipper

Corresponding

C. G. Sturtevant

Life

Charles Martin Clark, Jr.	Miss E. Mabel Clark
---------------------------	---------------------

Annual

T. L. Bailey	Mrs. Jane S. Embury
Elmer Behnke	Herman Forster
Jean Jacques Brodbeck	Roslyn Jackenthal
Dr. Louis J. Cizek	Hubert McDonnell
Aymar Embury II	Lisle F. McNabb

Charles Diller Ryan, M.D.

Junior

Alan Leviton	Albert Dore Pittis
--------------	--------------------

Takes Post at Museum



Dr. Charles M. Breder, Jr.

By FAIRFIELD OSBORN

Dr. Charles M. Breder, Jr., left our staff at the turn of the year and joined that of the American Museum of Natural History, to assume, during the current year, the position of Chairman of the Department of Fishes at that institution. Dr. Breder has been with the Society for 22 years, first as Aquarist of the Aquarium, then in 1937 as Acting Director of the Aquarium, and in 1940 as Director of the Aquarium. His work has always been of outstanding quality. We shall miss his active association with us very greatly indeed.

His numerous and original contributions to the science of ichthyology are too well known to need comment here. Suffice it to say that he has achieved eminence in his chosen field of work. At the same time his contributions to the more general purposes of the Society have been innumerable, among the more recent of which are his comprehensive studies in connection with the plans for the new Aquarium.

Since 1926 Dr. Breder has been a Research Associate of the American Museum of Natural

History, with the result that for many years both that institution and this Society have shared his talents. At a recent meeting of the Executive Committee of our Board of Trustees Dr. Breder was elected Research Associate in Ichthyology. We therefore look forward to a future in which this institution may continue to receive the advantage and value of his collaboration. In the meanwhile, we extend to him every wish for success and satisfaction in the new and important post which he is about to assume.

Coincident with Dr. Breder's departure, Mr. Christopher W. Coates has been appointed Curator and Aquarist of the Aquarium Department. Dr. Ross F. Nigrelli continues as Pathologist, and Dr. Myron Gordon has been appointed Assistant Curator.

PUBLICATIONS OF INTEREST

OUTLINES OF ENTOMOLOGY. By A. D. IMMS. E. P. Dutton and Co., Inc., New York. 1942. 184 pp., 96 illus. \$3.75.

In the words of the author, "This book is intended for anyone who is willing to take sufficient pains to acquire an elementary knowledge of entomology as a branch of general zoology." It is an excellent example of condensed, yet clear, information. In 184 pages and 5 chapters Imms writes of Anatomy and Physiology, Embryology and Metamorphosis, Classification and the Relationships of Insects.

Only a master of his subject could develop such an anatomical thesis in the abstract — the nerves, sense organs, embryology of the insect in general, with specific allusions and examples reduced to a minimum.

Unexpected nuggets of information are found in brief, pertinent appendices to the classification treatments of major Orders. The text is filled with many original drawings and the little volume is rounded out with a well chosen bibliography of important literature and an index.

It is an adequate textbook of fundamentals for the student, an up-to-date refresher reference for teachers and easily understandable by the interested layman. It is encouraging to realize that the British are able, at this time of all-out war, to devote part of their energies to the printing of such an excellent contribution to pure science. HENRY FLEMING.

ANIMAL KINGDOM



BULLETIN, PUBLISHED BY
NEW YORK ZOOLOGICAL SOCIETY

HOW "THE PACIFIC WORLD" CAME INTO BEING, *Fairfield Osborn* • DR. BEEBE EXAMINES
MID-VISTAS OF ZOO LIFE" • BRAKE ON THE FEATHER TRADE, *William Bridges* • NOTES

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York 20, N. Y.

PRESIDENT

Fairfield Osborn

FIRST VICE-PRESIDENT

Alfred Ely

SECOND VICE-PRESIDENT

Laurance S. Rockefeller

SECRETARY

Harold J. O'Connell

TREASURER

Cornelius R. Agnew

EXECUTIVE COMMITTEE

Fairfield Osborn, *Chairman*

Cornelius R. Agnew
Alfred Ely
Marshall Field

De Forest Grant
Warren Kinney

William De Forest Manice
David H. McAlpin

Robert Moses
Laurance S. Rockefeller

BOARD OF TRUSTEES

Class of 1944

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez

De Forest Grant
Eugene Holman
Warren Kinney

Henry R. Luce
William De Forest Manice
Harold J. O'Connell

Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1945

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely

Marshall Field
Childs Frick
Archer M. Huntington

David H. McAlpin
John H. H. Phipps

Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Class of 1946

George Gordon Battle
George C. Clark
F. Trubee Davison

Jay Downer
Robert I. Gannon

Robert Gordon McKay
Fairfield Osborn

Laurance S. Rockefeller
John M. Schiff
Frederic C. Walcott

Ex-officio, The City of New York

The Mayor, Hon. Fiorello H. LaGuardia

Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

John Tee-Van *Executive Secretary*

Jean Delacour *Technical Adviser*

Claude W. Leister *Curator, Education*

William Bridges *Editor & Curator, Publications*

Donald Marcy *Associate, Education*

Sanford Miles *Comptroller*

Millward W. Heath *Supt., Construction
& Maintenance*

ZOOLOGICAL PARK

Lee S. Crandall . *General Curator & Curator of Birds*

Leonard J. Goss *Veterinarian*

Claude W. Leister *Associate, Mammals*

Harry C. Raven *Associate, Anatomy*

John Tee-Van *Associate, Reptiles*

Grace Davall *Assistant to General Curator*

W. Reid Blair *Director Emeritus*

William Beebe *Honorary Curator, Birds*

AQUARIUM

Christopher W. Coates *Curator and Aquarist*

C. M. Breder, Jr. . *Research Associate in Ichthyology*

Ross F. Nigrelli *Pathologist*

George M. Smith . *Research Associate in Pathology*

Myron Gordon *Assistant Curator*

Homer W. Smith . *Research Associate in Physiology*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*

Jocelyn Crane *Research Zoologist*

Henry Fleming *Entomologist*

George Swanson *Staff Artist*

Associates

William K. Gregory
John Tee-Van

Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

VOL. XLVII

APRIL 1, 1944

No. 2

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York 20, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York 60, N. Y. Title registered with United States Patent Office.

Subscription, \$1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

That Question of Animal Intelligence

In the book "Creative Evolution," written by Henri Bergson more than thirty years ago, there appears the following definition which serves to clarify the much discussed question regarding the intelligence of animals:

"There is no intelligence in which some traces of instinct are not to be discovered, more especially no instinct that is not surrounded with a fringe of intelligence . . . neither intelligence nor instinct lends itself to rigid definition: they are tendencies, and not things."

Since this was written, experimental work has added considerably to the understanding of animal intelligence and behaviorism. But the general statement above still holds good, and with its acceptance there will be less reason for many of the fruitless discussions on the subject. Anyone who studies the actions of animals meets with endless surprises as to the things they do which are clearly outside the realm of pure instinct and definitely in the area of this "fringe of intelligence."

We human beings naturally form our judgments of intelligence according to our own definition of it, which in turn is derived from the pattern of our own activities and lives. In general, human civilization has developed in a curve corresponding to the increase in complexity of manufactured things. Consequently man's intelligence is gauged largely, and often unfortunately, by his facility in the use of more and more complicated mechanisms. This method of measuring intelligence has become so habitual with us that experiments made as to the amount of intelligence of animals usually revolve around the degree to which they are able to make use of tools or other artificial devices.

The most fruitful research work done in recent years has, in the main, followed this method and great advances have been made through laboratory experimentation. Laboratory work has its distinct advantages in that animals under study can be kept under constant observation. We make a plea, however, for the use of additional methods, particularly for an increase in well-organized researches in the field, where animals are in their own natural environment. At a period when man is getting an overdose of his own mechanisms, we might almost conclude that animals have more sense than we give them credit for.

It would be engaging, one of these days, to learn what the animals themselves think about it.

Fairfield Osborn

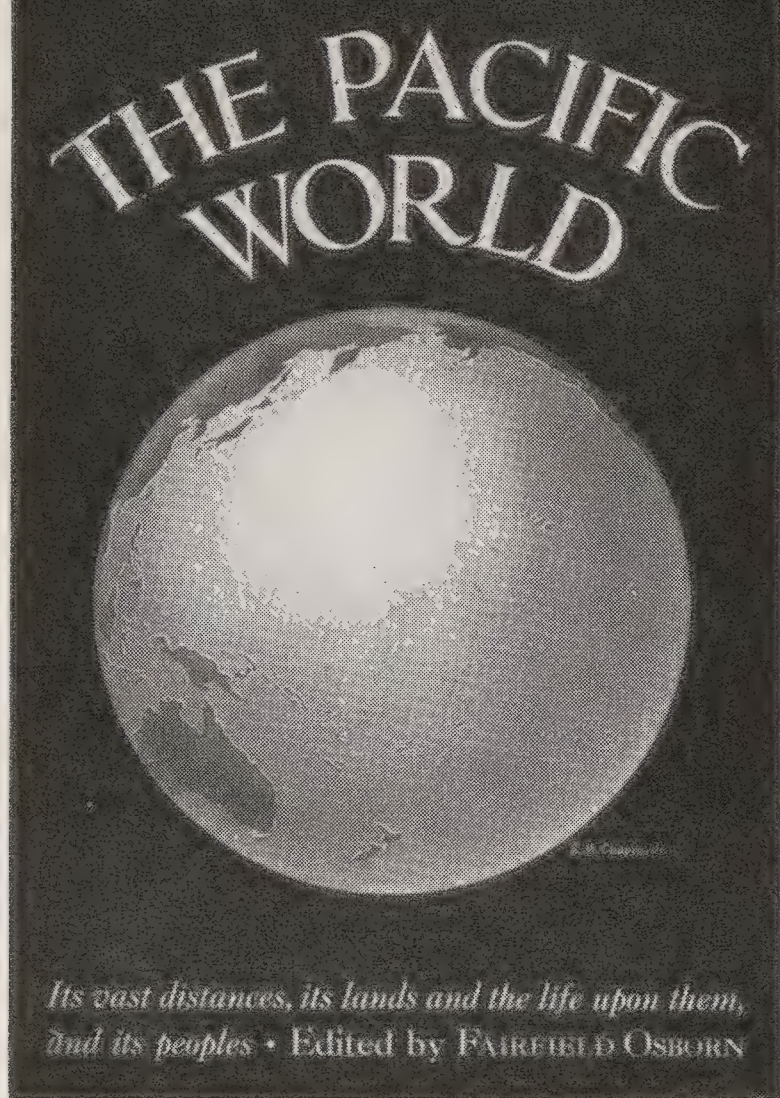
IN THIS ISSUE

Pel's Fishing Owl	COVER
Genesis of a Book	<i>Fairfield Osborn</i> 27
Magna Charta of the Birds	<i>William Bridges</i> 33
Mid-Vistas of Zoo Life	<i>William Beebe</i> 37
Charles Haskins Townsend	<i>Fairfield Osborn</i> 42
Behind the Scenes: News and Notes	45



MAMMALS OF THE PACIFIC

Such entertaining—and accurate—plates as these are scattered through “The Pacific World” and are intended to give the reader a quick impression of the origin and variety and profusion of animal life in the



GENESIS of a Book

FAIRFIELD OSBORN tells how "The Pacific World" came to be written and we offer a sample chapter and illustrations from the forthcoming book.

A SERIES OF BOOKS on the natural history of the Pacific is about to be published. How these happened to come into existence is a story of its own and illustrates the well-known fact that small incidents frequently give rise to considerable consequences.

The sequence of events runs something like this. About a year ago the Conservation Committee of the Zoological Society, in concert with the American Committee for International Wild Life Protection, came to realize that some pamphlets should be prepared for distribution to the Armed Services on the animal life on some of the Pacific islands where our troops were stationed. Childs Frick, Chairman of our Conservation Committee, and Harold Coolidge of the American Committee, had first propounded the idea. Everyone was aware that our men in the Armed Services, unless they were given a point of view regarding the desirability of preserving wild life on the islands on which they were stationed, would in all probability do a lot of random killing just for "target practice." As a consequence, a group meeting was held of a number of men of various scientific institutions to discuss ways and means of getting the pamphlets written. Everyone present realized that descriptive literature about the Pacific area was remarkable for its absence. Not only were there no popular books that would provide the reader with a good gen-

eral idea of the physical characteristics of the Pacific, but, beyond that, books on the natural history and animal life of the area were few and far between and those that did exist specialized in detailed studies of only certain specific areas. As a consequence every man at this first meeting realized that a very unusual opportunity presented itself and that a considerably broader plan than that originally considered should be carried through.

It was therefore planned that the first book of the series, — which has since been titled "The Pacific World" — should be an overall and general description of the physical aspects of the Pacific, its vast distances, its lands, the life upon them, and its peoples, this first book to serve as a foundation-piece to a series of supplementary handbooks covering the following subjects:

- Mammals
- Birds
- Reptiles and Amphibians
- Fishes
- Insects
- Marine Invertebrates
- Plant Life
- Native Peoples

"The Pacific World" will be illustrated by a number of original color plates specially prepared for explanation of parts of the text itself. The book is designed upon the general premise that we Americans will do well to know more of the great area which lies to the west of our shores. This book has gone to press and should be ready for distribution during April. Work on the supplementary books is well along and they, in turn, will appear at intervals during this year.

Having in mind the fact that the primary pur-

pose of these publications was for their use by the very large numbers of American men and women serving their country in the Pacific, arrangements were happily concluded with Colonel Joseph I. Green, editor of *The Infantry Journal*, with the result that an initial printing of 100,000 copies of "The Pacific World" is to be made for the Armed Services and it has also been arranged that there shall be large editions of each of the handbooks. Thus, an extremely large volume of literature on the natural history of the Pacific area is about to be widely circulated.

In addition to all of this we found that there was a strong demand on the part of publishers for a popular edition for the general public, and arrangements were soon concluded with the W. W. Norton Company, which is handling this edition for general release.

No enterprise could be marked by a higher degree of unselfish collaboration than has existed in the preparation of this series of publications. The names of the men and of their institutions engaged in the preparation of "The Pacific World" are as follows:

American Geographical Society
John K. Wright

American Museum of Natural History
H. E. Anthony
W. H. Barton, Jr.
T. D. Carter
C. H. Curran
Childs Frick
W. K. Gregory
J. E. Hill
Frank E. Lutz
Ernst Mayr
Robert Cushman Murphy
John T. Nichols
Henry C. Raven
H. L. Shapiro
G. H. H. Tate
E. M. Weyer, Jr.
John T. Zimmer

Arnold Arboretum
E. D. Merrill

Blue Hill Meteorological Observatory
Charles F. Brooks

Carnegie Museum
Andrey Avinoff

Chicago Natural History Museum
Karl P. Schmidt

Museum of Comparative Zoology
Thomas Barbour
Arthur Loveridge

New York Zoological Society
William Beebe
Claude W. Leister
Ross Nigrelli
Fairfield Osborn

Smithsonian Institution
Alexander Wetmore

The table of contents of "The Pacific World" is as follows:

	Foreword
	The Pacific Is Before You — an Introduction
I	The Ocean
II	The Islands
III	Climate, Winds, Currents and Tides
IV	Discovery and Exploration
V	The Native Peoples
VI	Ocean Life
VII	Stars Over Melanesia
VIII	Island Life
	Mammals and Birds
IX	Island Life
	Reptiles and Insects
X	Island Life
	Plants
	Regional Descriptions:
XI	Australia and New Zealand
XII	Melanesia
	New Guinea, New Britain, Bismarck Archipelago, Solomon Islands, New Hebrides, New Caledonia, Loyalty, and Fiji Islands
XIII	East Indies
	Borneo, Sumatra, Java, Celebes, Timor, The Lesser Sundas, Spice Islands (Moluccas)
XIV	Philippines
	Luzon, Cebu, Mindanao, Palawan
XV	Micronesia
	Palau, Caroline, Mariana, Marshall, Gilbert, and Ellice Islands
XVI	Polynesia
	Tonga, Samoa, Phoenix, Society, Marquesas, Cook, Hawaiian, Tuamotu, and Easter Islands
XVII	Aleutians, Pribilofs, Galápagos
	Fox, Andreanof, Rat, Kiska, Attu Islands; Pribilof Islands, Galápagos Islands
XVIII	Formosa, Luchu, and Kurile Islands
XIX	Japan
XX	Tables and Factual Summaries

It is hoped that the broad variety of subjects dealt with in "The Pacific World" and the variation in the presentation of the subjects will interest many different kinds of readers.

There follows herewith an excerpt from the chapter descriptive of the origin and distribution of mammals on the islands of the Pacific, with a color plate and some of the line drawings which will accompany this chapter.

MAMMALS



ANYONE who has ever seen the long-nosed proboscis monkey of Borneo is not likely to forget him—he is like no other animal on earth. This uniqueness is probably the most fascinating feature about so many of the animals of islands. The curious crested kagu, a relative of the crane, found in New Caledonia, the flightless kiwi bird, and the tuatara lizard of New Zealand, the small and peculiar buffalo of the Philippines, the babirusa boar of Celebes—to cite a few random examples—are quite different from all other birds, reptiles, and animals, and are found nowhere else in the world but on those particular islands.

Why are many of the animals and plants on islands so extremely different from those on the mainland? Where did those unique forms of life come from? If their forebears originated on the continents, when and how did they reach the islands?

Answering the last question first, it is believed that the ancestors of *all* things living upon islands arrived accidentally from one or more of the continents or from some other island, itself first populated from the continents. The life of the continents is the source of all island life.

Since far back in geological time, occasional continental animals and plants have been carried through the air by storms or out to sea by flooded rivers. Of those strays, perhaps one in a thousand has been carried to some island alive and in a condition to reproduce its kinds. This slow but continuous process has brought about the colonization of islands, except in the case of islands that in the past were joined by land connections to the mainland.

Just as, on the continents, the multitudinous animal and plant life passed through a long, slow, intricate history of development of new forms, which by process of trial and error became adapted to fit the changing conditions about them, so, on islands, newly arrived animals evolved. Their shapes, colors and behavior became slowly modified, permitting their descendants at length to occupy many kinds of habitats to which the first arrival was unsuited.

Development of life on islands, once established, was in general a reproduction in miniature of the development of life on the continents. But island life steered its own course in complete independence. Islands thus became repositories of the species that colonized them, while on the continent that same species might be wiped out by more aggressive, competing species. In some cases colonizers found competition slight or negligible and consequently prospered. On the other hand their subsequent adaptation to local conditions was potentially dangerous, for they had lost much of their powers of accommodation, and relatively small changes in the conditions of the islands would threaten their extinction.

For the purpose of explaining the presence and the distribution of living animals on the islands

of the Pacific Ocean, the islands may be thought of in two ways: first, in relation to their geological history, and again, in relation to their geographical positions. Both systems of classification are helpful. But because the geological history explains most of the present-day puzzles in animal



The prehensile-tailed cuscus is a slow-moving, nocturnal animal of the Australasian region.

distribution, it is generally preferred. Under geological classification, islands comprise two types—continental and oceanic. By definition, continental islands are those that rise from the continental shelves and actually form parts of the continents, separated from them only by shallow water. Oceanic islands are those that rise from the bed of the ocean and are separated from the continents by great depths of water; they may be only a few score miles from continental lands or several thousands of miles away.

The continental islands were connected with their respective continents during the last ice age, which ended about 30,000 years ago. In those times such an immense volume of water from the oceans was frozen in the polar icecaps that the ocean level is estimated to have been some 300 feet lower than it is today. The direct effects of this reduction of sea level were to reunite many of the continental islands to their parent continents and to make certain of the oceanic islands larger, at the same time reducing the widths of the deep straits or seas now dividing them from the continents. The former union of the continental islands with the mainland explains how the big mammals, like the rhinoceros

or orangutan, reached such large islands of the western Pacific as Sumatra and Borneo.

The animal and plant assemblages that have contributed to the population of the continental islands of the Pacific are derived respectively from three principal sources—the temperate North American and north Asiatic regions, the warm southeast Asiatic or Malay region, and the Australian region. The mammals of the Australian region, vastly different from those of the rest of the world, are the special descendants of the survivors of that far-distant day when pouch-bearing animals were the common inhabitants of both America and Europe.

In the case of the oceanic islands, smaller mammals may have arrived by natural rafts—masses of trees and vegetation that were undermined by rivers and carried out into the ocean by winds and currents. Tree-living types of animals would be most easily transported in this way, although only one of such natural rafts out of perhaps thousands would reach another island. When the distances between islands were not too great, a number of the larger mammals undoubtedly



“Unforgettable” is the word for the curious proboscis monkey that is found on Borneo.

swam across the water barriers. Deer and various types of wild pigs are capable of doing this. Flying mammals, the bats, would be assisted by storms or strong winds to make a longer than usual flight. The more isolated islands, however,

might be successfully reached only once, or by a very limited number of mammals. Small populations are easily exterminated, and the animal life of an island may have formerly included species that were unable to persist. Large mammals are especially liable to this risk; on a small island their numbers are so limited that disease or an unfavorable year might destroy them, or in later times the human inhabitants might have killed them off. Naturally, large islands close to a continent were far more likely to receive such waifs than were tiny islands in the midst of the ocean. Furthermore, the larger islands offered a much wider choice of environment, and thus provided more frequently for the special requirements of different kinds of animals.



**Tarsier of the
Malayan region.**

An interesting example of the workings of distribution is provided by the great mass of large and small islands collectively called the Indo-Australian Archipelago. This mass includes both continental and oceanic islands. The continental islands are Sumatra, Java, and Borneo and, as we should expect, their animal life is derived from tropical Asia and the Malay Peninsula.

The oceanic islands include the Philippines, Celebes, the Moluccas, and the Lesser Sunda Islands. It is held that the area occupied by these islands underwent great geological changes in prehistoric times, including upheavals and depressions, but there is no evidence that any land connection between these oceanic islands and the continent of Asia ever existed.

This particular area has been named "Wallacea," after the naturalist, Alfred Russell Wallace; and the line of the continental shelf—which runs west of these islands from between the islands of Bali and Lombok, north through the Strait of Macassar and through the Sulu Sea—is commonly known as "Wallace's Line." Wallace believed that this line indicates a boundary sep-

arating to a great extent the animals of Asia from those of Australia. Actually the region is, in a sense, a no man's land, its mammals being derived principally from Asia but to a very small extent from Australia.

The animal and plant life of Celebes is a case in point. This island lies only some eighty miles to the east of the continental island of Borneo (in the glacial period this distance was even shorter, reduced to approximately twenty-five miles) and more than seven hundred miles from Australia. Its mammals are predominantly of Asiatic origin. However, in parts of Celebes there are certain plants and animals so reminiscent and characteristic of Australia—the eucalyptus and nettle trees, the white cockatoo, and the cuscus, a pouch-bearing animal—that an untrained observer might think that he was in the forests of Queensland in Australia.

The nearness of the oceanic islands of Wallacea to the mainland and continental islands of Asia and Australia accounts for the profusion and variety of life dwelling on them, in comparison with the paucity of life on scattered groups of tiny islands in the mid-Pacific.

The animals and plants of any remote island are likely to be a random assortment derived from almost any part of the mainlands bordering the Pacific. In actual fact, Asia and Australia have in general contributed a much higher percentage of the animal and plant life of the oceanic islands than have the Americas. The only oceanic islands that have some mammals of American origin are the Hawaiian Islands and the Galápagos.

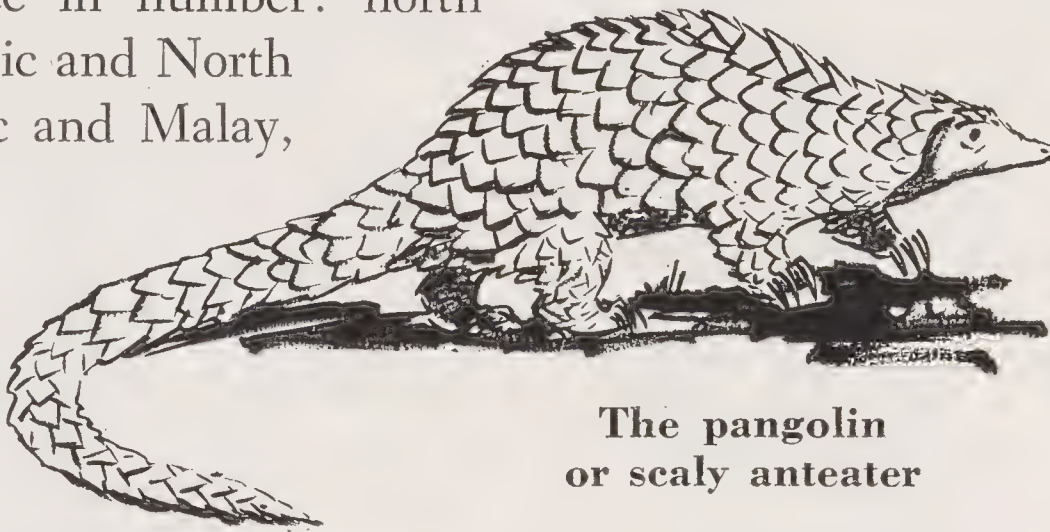
The process of differentiation on islands has been continuous. The species of one island became distinct from those of another, or on individual islands, mountain-living forms became separated from lowland races, and types preferring humid forests diverged from those inhabiting dry areas.

Animals that show greatest differences are believed to have descended from the earliest arrivals. Those which, on the contrary, are more like their mainland relatives are thought to have come later. The few animals and plants that are identical with those on the continents have without doubt been carried to the islands by man.

It has been shown that the fauna of continental islands is derived from the neighboring con-

tinents, that animals reached the oceanic islands by random drift from the continents, that larger oceanic islands nearer the continental sources received many more kinds of animals than smaller islands in mid-ocean, and that those continental sources are primarily three in number: north Temperate (northern Asiatic and North American), tropical Asiatic and Malay, and Australian. Central and South America contributed only to the faunas of the few islands relatively close to their coasts. The Galápagos Islands received their populations mainly from Central America.

As stated in the opening paragraphs of this



The pangolin
or scaly anteater

chapter the most compelling characteristic of island life resides in the remarkable difference of so many of the animals and birds and plants from those dwelling on the continents. It has been shown that islands have acted as places of refuge for many a species threatened with extinction and later wiped out by nature on the mainland. "Extinct as the dodo," is a common expression with an appalling sense of finality. It is fervently to be hoped

that, so far as is humanly possible, those fascinating and irreplaceable island species may be preserved for posterity.

Man vs. Chimpanzee

AN EXPERIMENT to determine the bodily strength of chimpanzees was set up at the Yale Laboratories of Primate Biology and it appears that while adult men and adult male chimpanzees are "roughly equal in absolute pulling strength," the anthropoid apes would definitely have the better of it in a tug-of-war if they weighed as much as their human opponents.

In the experiments described by Glen Finch in the *Journal of Mammalogy*, four adult male chimpanzees and four adult men pulled as follows:

Subject	Bodily Weight lbs.	Maximum Pull lbs.
Man No. 1	190	525
Man No. 2	145	487
Man No. 3	145	450
Man No. 4	135	338
Chimpanzee No. 1	122	450
Chimpanzee No. 2	108	450
Chimpanzee No. 3	107	487
Chimpanzee No. 4	106	375

Four female chimpanzees were tested in the same experiments, but they proved to have less pulling strength than either the men or the male chimpanzees.

MAGNA CHARTA of the Birds

By WILLIAM BRIDGES

NEARLY A THIRD of a century ago the New York Zoological Society was in the middle of a slam-bang fight to take wild birds off women's hats. The fashions of 1913 seem ridiculous and even pathetic now, but they were no laughing matter when David in the person of Dr. William T. Hornaday challenged the feather millinery Goliath. He started a fight that raged for months through the halls of Congress and across the platform of women's clubs.

Only the older members of the Society may remember the famous "Steam Roller Circular" that snatched victory out of defeat and a whole generation has grown up that takes the wild bird protective clause of the 1913 tariff act for granted — if, indeed, it knows there is such a thing.

But the machinery that Dr. Hornaday set in motion thirty-one years ago is still grinding away, moving so smoothly and quietly that only rarely does an attempted importation of feathers come to the attention of anyone outside the circle of the interested parties — the United States Appraiser's Office and the would-be importer. Just such a case occurred this winter and the Zoological Park was able to make a contribution to its tentative solution; the incident made us wonder what *has* happened since 1913 saw the writing of the Magna Charta of wild bird life all over the world.

It was around Christmas that a young man from the Appraiser's Stores came into the Zoological Park with a brown paper parcel. He unrolled it on General Curator Crandall's desk and spilled out half a dozen white and rainbow-tinted bird skins. They were down-skins from some duck-like bird, light and fluffy as powderpuffs — and, in fact, they were the raw materials from which American manufacturers expected to

Back in 1913 Dr. Hornaday battled for a Tariff Act that would stop the traffic in feathers and plumes—and he took the birds off of women's hats.

make that familiar implement of a woman's handbag. The gaudy colors of some of them came from dyes in which they had been dipped.

"These are samples of a bundle of skins that came into the United States from South America recently," the young man explained. "The importer claims they are goose skins, but we never saw any goose skins quite like these and we have an idea they might be swan skins. It makes all the difference, of course — goose skins are not from wild birds and can be admitted to the country, but swans are protected under the 1913 Tariff Act. What do you think about them?"

With the suspected skins was a down-skin known to be from a domestic goose and to the eye and the touch there was, indeed, a good deal of dissimilarity.

"We've made a microscopic examination and the goose down isn't the same as the down on these other skins," the government man went on. "What we'd like to do, is to get some known down from a swan and compare it, too."

As it happened, a whistling swan had died the day before and a quick telephone call revealed that the body was still in the icebox at the Zoo's Hospital, awaiting autopsy. Dr. Goss removed the skin, bundled it up for the young man and sent him away rejoicing.

Later we heard that our swan's down checked microscopically with the down of the "goose" skins from South America.

So the Federal Government is still on the job of keeping the feathers of wild birds out of the

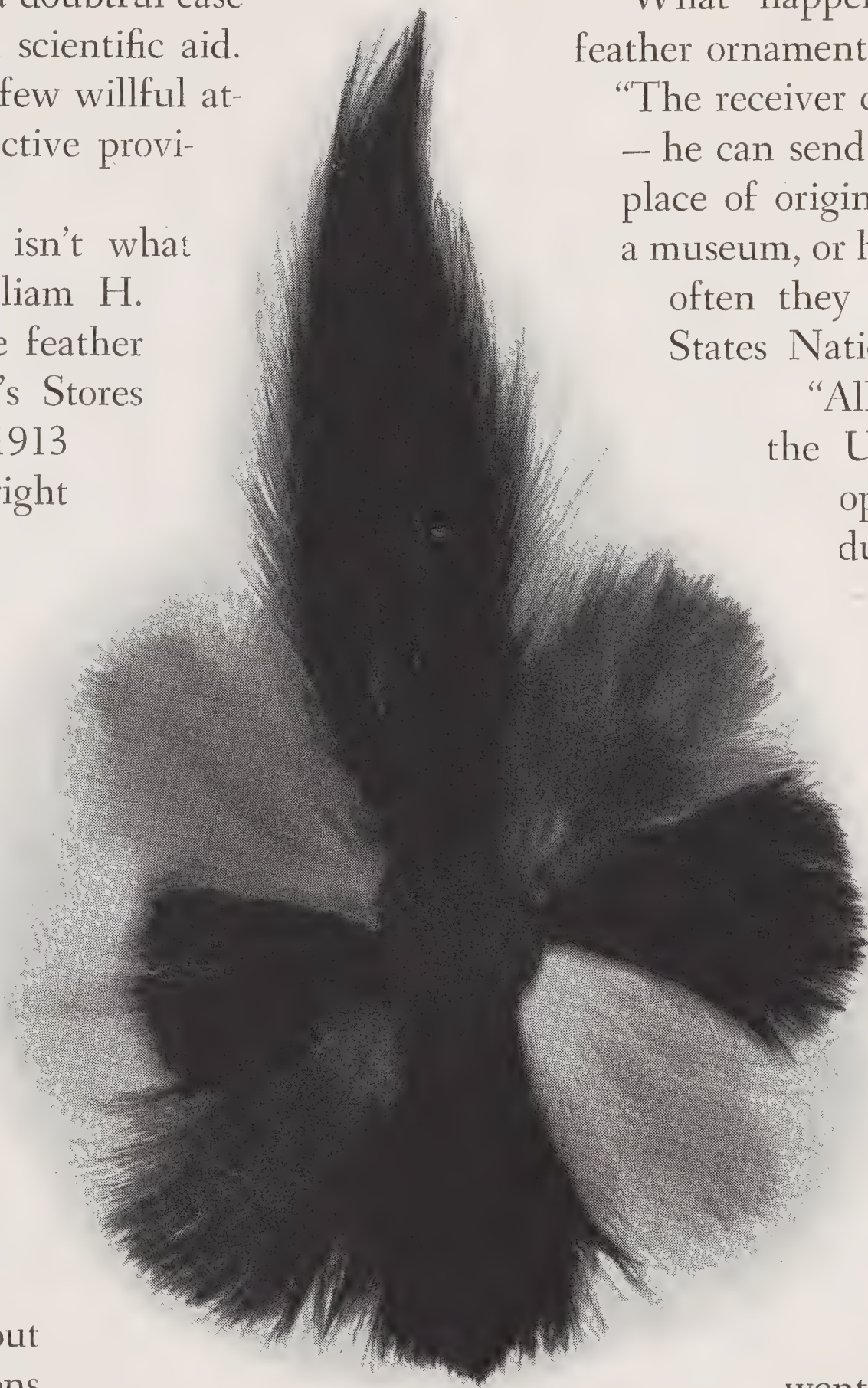
United States, and when a doubtful case arises it summons modern scientific aid.

Actually there are very few willful attempts to evade the protective provisions of the 1913 law.

"The feather business isn't what it used to be," said William H. Ehmann, in charge of the feather division at the Appraiser's Stores in Varick street. "The 1913 tariff knocked the bottom right out of the feather millinery industry that depended on wild bird feathers. Now there's no market for the vast majority of wild bird skins even if someone did try to slip them into the country. A woman wouldn't be caught at a dog-fight with a stuffed bird on her hat.

"Great quantities of feathers still come into the country, of course, but with certain legal exceptions they are almost all the feathers and skins of domestic birds. About the only wild bird cases we have are such things as native ornaments that tourists pick up in foreign countries, and commercial importations where the shipper claims the birds were domesticated—and we make him prove it, or else forbid the entry.

"A great many people don't understand that the source of the feathers doesn't make any difference as long as the birds are classed as wild by the law. Lots of native tribes in South America, the Pacific and so on, make beautiful feather head-dresses and ornaments and tourists used to buy them—I'm talking of the days before the war, naturally—and mail them home or bring them in with their baggage. They couldn't come in—even if they were fine enough to be called museum pieces."



This design of egret plumes was composed of variously-colored feathers in a shipment seized on the Mexican border after the Tariff Act went into effect.

"What happens to them—really fine feather ornaments, for example?"

"The receiver can do one of three things—he can send the feathers back to their place of origin, he can present them to a museum, or he can destroy them. Quite often they are given to the United States National Museum."

"All parcel post mail into the United States is routinely opened and examined for dutiable and forbidden merchandise and thus even the casual shipment of a single feather or skin is discovered. Men in the armed forces occasionally send home bright-colored feathers but most of them have learned that entry is forbidden and the practice is not general.

"All the feathers we have turned back since the 1913 tariff went into effect would make a mighty small pile against the feathers and skins that came in during one year at the height of the feather millinery period," Mr. Ehmann went on.

"Wild bird skins used to come in literally by the ton. When they were shut off, the industry was hit hard and the feather dealers in Paris made a strong attempt to keep going with imitations of wild bird plumes, but the shape of hats changed late in the 'Twenties and the whole thing went out of fashion. You may remember those brimless hats, shaped like a bucket. There just wasn't much place for a spray of plumes or a stuffed bird—even imitation plumes.

"The Paris dealers tried hard, though. I remember they had a way of skinning down a peacock feather until it was a pretty good imitation of an aigrette plume. They made rooster tail feathers to look like Bird of Paradise plumes,

they printed white goose feathers to look like Silver Pheasant feathers, and somehow they managed to make a fairly authentic-looking goura crest out of goose feathers. All those imitations were legal, of course; no objection at all to bringing them in as long as it could be proved they were made from the feathers of domestic birds, and as long as the duty was paid.

"There was quite a while after 1913, before the fashion died out, when hats were loaded down with all sorts of imitation flowers and imitation wild-bird plumes. But then the cloche hat came in and even the imitations were washed up."

France is still — or was, before the war — the center of a big feather industry and great quantities of skins and feathers of domestic geese, especially, were shipped to this country. The

skins of geese stripped of their guard feathers until only the down was left were used in making powderpuffs and the trimming on children's and dolls' dresses. French exporters customarily leave the neck of the bird as part of the skin and that fact, as well as the size of the skin, made it recognizable as from one of the domestic varieties of geese.

The clause in the Tariff Act of 1913 which saved countless species of wild birds from extermination was short but effective. It said:

PROVIDED, that the importation of aigrettes, egret plumes or "osprey" plumes, and the feathers, quills, heads, wings, tails, skins or parts of skins, of wild birds, either raw or manufactured, and not for scientific or educational purposes, is hereby prohibited; but this provision shall not apply to the feathers or plumes of ostriches, or to the feathers of domestic fowls of any kind.



The feather exclusion provisions of the 1913 Tariff Act were directly responsible for the outlawing of such plumes as these—all skins of the Lesser Bird of Paradise. These particular skins were seized on the Mexican border in 1916 as a millinery trade importer was trying to smuggle them in.

That was the phraseology of the law as drawn up by Dr. Hornaday and bodily thrust into the Tariff Act despite the violent opposition of the feather millinery industry. Early in the hearings of the 69th Congress on the new tariff law, Dr. Hornaday for the Zoological Society and T. Gilbert Pearson for the National Association of Audubon Societies had appeared before the Ways and Means Committee of the House and had succeeded in getting their protective clause inserted unchanged in the House bill.

The feather trade, Dr. Hornaday wrote later, "had been caught napping." It made up for its carelessness when the tariff was debated in the Senate, however, and in a Senate sub-committee so amended the clause that it was valueless. It was then that Dr. Hornaday sat down and drafted the four-page blast: "The Steam Roller of the Feather Importers in the United States Senate."

He named names. He pinned responsibility for the defeat of protection on definite Senators and definite feather import firms.

"Who shall rule?" he concluded. "The 50,000,000 people who are interested, or the

thirty importing feather dealers of New York?"

Twenty-four naturalists, editors, women's club leaders — all representing large blocks of the population — signed the "Steam Roller Circular."

The Senate passed the Tariff Bill with the Hornaday protective clause intact. And as Dr. Hornaday wrote in 1931, in "Thirty Years' War for Wild Life"—and as we have found today — the protection has been rigidly enforced ever since.

Nevertheless, there are certain loopholes; the 1913 Tariff Act, for instance, permitted the importation of wild bird feathers for use in making artificial fishing flies. Rhea feathers are permitted to enter, the law considering rheas both as wild and as domestic birds — although importers have to prove that their feathers came from domestic rheas. Both of these provisions are currently under attack by conservationists, particularly the National Association of Audubon Societies.

But by and large, Dr. Hornaday's great achievement still stands. Never again will a woman walk down Fifth Avenue with eight stuffed hummingbirds on her hat.

Speed of Animals

THE AUTOMOBILE and the airplane are constantly contributing to our knowledge of the speed of animals and some interesting figures are presented in recent issues of the *Journal of Mammalogy*. The speeds given here were clocked by automobile speedometer by Clarence Cottam and C. S. Williams of the U. S. Fish and Wildlife Service and are for distances of 50 yards to half a mile, over various types of terrain. The figures refer to miles per hour:

Elk, 45; Antelope, 45, 32; Black-tailed Jack Rabbit, 38, 30, 28, 27, 18; White-tailed Jack Rabbit, 34; Moose, 35; Coyote, 31; Buffalo, 30; Desert Bighorn, 30; Deer, 25.

Another Fish and Wildlife Service representative, R. Scott Zimmerman, clocked a coyote at a top speed of 43 miles an hour. Clarence A. Sooter of the same Service determined the maximum speed of a two-point buck mule deer as 35 miles an hour, of a doe and two fawns as 28 miles an hour, and of a coyote as 29 miles an hour.

Dr. Beebe Surveys the **MID-VISTAS of Zoo Life**

While the Bronx Zoo's 250 acres were a mere part of the tangled wilderness, they saw the rise and fall of some weird and wonderful creatures.

By WILLIAM BEEBE

SOME MONTHS AGO we spoke of ancient creatures in the Zoo, and how we would have exhibited dinosaurs and plesiosaurs.¹ Then we reminisced of the wolves and bison and turkeys when they were pre-Bronx suburbanites,² such a short time ago. In these days when our exhibits receive so few bird and animal refugees from Asia and Africa, it is worth while recalling mid-vistas of animal life in the past, in and around our Zoo, when our 250-odd acres were only an indefinite part of the surrounding forest. To do this I need not go beyond the time of man or almost man.

Just now it is rather a relief to leave the present conditions of life and death on our planet and think back almost two milleniums to the birth of the Prince of Peace; then three more when man was building Cheops, his most enduring monument; on another two thousand years and we find Babylonian cities already large and flourishing. Pass back twenty full thousand years from our day and even then man was drawing and coloring the wild creatures he knew, on the walls of his cave. In fact men of some sort must have seen and fled from almost all the creatures of which I am thinking. These beasts compel our interest, for like ourselves, they all once called home, this very place where we live today. It was home for them far longer than it has been for us.

The Broadway Mastodon

YEARS AGO I remember following a circus parade up Broadway. A half dozen elephants swung slowly along in their preoccupied, aloof manner, forever immersed in some proboscidian reverie. They passed the many blocks solidly built up with houses, and on uptown plodded by the vacant spaces of high, rounded glacier-worn rock. One elephant seemed to me immense — he must have been full eight feet in height. All had been brought from India and with dignity and gentleness submitted their lives to be dictated by their human masters.

Thousands of years before, on this very spot, all that was recognizable of my circus parade was the sunlight, sky and air, and the same glacier-scoured rock. Yet about this time (years and months and days not having been invented) another elephant had wandered up this way, along some pre-Broadway game trail — a strange elephant, what we now call a mastodon.

On this particular day he stepped to one side, perhaps to pluck at a branch of hemlock. He suddenly felt himself sinking into a bog. The more he struggled, the more he sank. And there he died. A few years ago when the Harlem ship canal was being cut, a workman found one of his ivory tusks. It lay beneath four feet of sod and

¹ ANIMAL KINGDOM, 46: 3, pp. 50-55

² ANIMAL KINGDOM, 46: 5, pp. 111-116



of tropical jungles. Our only way to see a living creature even faintly mastodontian is to be on hand, in zoo or circus, at the birth of a baby elephant. The little chap is proportionately longer in body than his mother and is clothed in an astonishingly thick coat of hair, which, little by little, is shed and passes to the

The "Broadway Mastodon" at home. In Greame Kelley's conception of the scene, the towering buildings are of course just a dream of things to come.

final resting place of the hairs of infant elephants. Finally there remains only a tuft of stiff, wire bristles on the end of his tail. The skull of a new young elephant also has more of a snout than that of his parents, and in this respect it distinctly reflects the elongate head of a mastodon.

A well-grown bull mastodon must have stood nine feet in height at the shoulder, and was quite fifteen feet long. The large teeth made possible the long life of these, as of living elephants, for an eater of grass exists only as long as its teeth. We know from fossil remains that these great mastodons suffered from teeth decay and from pyorrhea. The passing of tens of thousands of years does not diminish our sympathy for the pangs of toothache which must have emanated from a molar seven inches long, weighing perhaps twenty pounds!

One very interesting thing about mastodons was the presence of a small tusk at the tip of the lower jaw, sometimes one, sometimes a pair, reminiscent of a far distant ancestor which was furnished with four long tushes of equal size, the tips of each pair crossing the other far in front of the head. Examination of the remains of food packed between the giant fossil molars reveals a preference for the needles of hemlock and spruce rather than for the softer fodder of deciduous leaves. In fact, five bushels of crushed

roots and twelve feet down at the bottom of the selfsame peat bog.

Very likely he was one of a herd of these great elephants; for in those olden days they were common hereabouts. The remains of more than one hundred have been found in New York State, some of them almost complete skeletons. Scallop fishermen have even brought the molar teeth of these beasts up from the bottom of the sea, sixty miles beyond Sandy Hook, showing that the great pachyderms wandered along the Hudson Gorge when it was still in the making.

The first unelephant-like thing we notice about our mastodon is his dense coat of dark reddish hair, showing him to be a camp follower of glaciers and a lover of ice and snow rather than

twigs of these conifers have been found piled between the ribs of one fossil skeleton preserved in a peat bog. Mastodons were not wholly averse, however, to moss and marsh plants and even prehistoric blossoms.

Whether a mastodon trumpeted or squealed,

what soft-bodied unfossilizable creatures he watched from day to day, what his new-born offspring looked like — these are forever lost to us, together with all the other mysteries of these cold old days, when wandering glaciers crept back and forth over the face of our land.

Sabre-Toothed Tiger

LONG AFTER DARK, on a night when the snow glistens in the moonlight, we may hear, at the edge of some wood close to New York, the long-drawn out squawl of a bay lynx, the largest wild cat left near our city. If we watch we may see the animal creep into the shadow of a fallen tree and perhaps leap upon a rabbit.

In days long past, in a warm interval between the eon-slow ebb and flow of glaciers, we might have seen in this very spot a mighty cat as large as a polar bear, mushing along on short but incredibly muscular legs. We know it today from its fossil bones as the sabre-toothed stabbing tiger, but probably instead of being striped it was dun or self-colored like our lynx. Strangely enough it was also lynx-like in possessing a very short tail, which by no possibility could be lashed from side to side as in living lions and tigers.

Its most remarkable characters were the two

great canine teeth, eight and even nine inches in length, which hung down from the upper jaw, and gave it a most terrifying appearance. These were so conspicuous that they can be compared only with the long tusks of a walrus or the rapier-like fangs of a deep-sea viperfish. The lower jaw swung down and back to a full right angle, to give play to the brace of enamel blades.

In the sabre-tooth we have a super-feline, more powerful than any living tiger, short-legged, over-toothed and over-muscled. The enormous tusks would be of little use against small game such as rabbits or squirrels. But we can imagine this dawn tiger stalking a slow-moving, massive mammoth or a giant ground sloth, springing upon its prey and killing it with deep slashes of the long dagger fangs.

The great body and leg muscles together with the unusually large talons would ensure an un-



Courtesy American Museum of Natural History

The Sabre-toothed Tiger has a dramatic role in this scene at an ancient waterhole, as painted by Charles R. Knight. Against such adversaries as the gigantic ground sloths at the right, or the hulking mammoths in the background, the fangs and great strength of the killer would be most effective.

breakable grip on the back of the struggling prey, and the sabre-tooth also had the advantage of five toes and five claws on the hind feet, one more than any modern cat can boast. So far we are reasonably sure of the method of attack. But the abnormal size of the cutting teeth had, through the ages, caused a radical reduction in all the rest, so that there were only ten teeth in all, as compared with the thirty-odd of its ancestors. With such a feeble armature, any efficient biting off of pieces of flesh or chewing them would seem impossible, especially as the huge fangs must have constantly been in the way. So we

must admit ignorance of the niceties of the feeding of the sabre-tooth.

Probably the specialized diet brought about by the equally unusual dentition resulted in the extinction of these ancient tigers. This seems reasonable from the fact that when the great elephants and sloths vanished from the earth, the sabre-tooths also disappeared. But in their heyday great numbers of sabre-tooths ranged from California and Pennsylvania south to the pampas of Argentina. We know that at least two species roamed the hills and valleys in Pleistocene times within one hundred miles of New York City.

The Manhattan Grubber

IT IS HARDLY FAIR to leave the comparative newcomers to New York without some reference to the Oldest Inhabitant.

Let us take the ferry to Fort Lee and climb up to the top of the Palisades. The trains at our feet move heavily along like humble worm-like creatures, and microscopic bugs of automobiles crawl even more slowly. Tugs and larger ships creep back and forth over the waters of the Hudson, and occasionally a plane drifts down river, a tiny, gnat-like mote in the heavens. On the opposite bank is spread out a thin, frail crust of human habitations.

Before another hour of the future rushes upon us, becomes momentarily present, and eternally past, let us go in imagination back and back—ten, twenty, fifty, one hundred, two hundred million years. All human trace vanishes in an infinitesimal fraction of time; mammoths and stabbing tigers hardly less rapidly. Finally we sit up and look about us in what geologists call the Triassic Period. We are considerably lower on the Palisades than we were, for the lava on which we had been resting has not yet poured forth from its parent volcano. But the reddish sandy marl (which we can still see in the real today, halfway down the cliffs) is being formed on a sandy or muddy plain, dotted with scattered swamps and ponds, both here and across the river and beyond to the pre-Zoo.

Great ferns and horsetails are still in evidence but are giving way to the first dwarf conifers; the very beginnings of birds and mammals are

in the making, the later ancestors of ours being replete with reptilian bar sinisters still conspicuous on their physical escutcheons. Of the life of this era within the hundred-mile circle around our city we know rather from foot-prints than actual fossil remains. We find the tracks of gigantic beings, slow and ponderous, to whose appearance we have no clue, and across them run tiny prints of hasty defenseless creatures, fleeing for their lives. We find the hieroglyphics of worms, but no hint of the makers.

A few years ago there occurred a great piece of scientific luck at this very Fort Lee. There was uncovered a jumble of bones, so well preserved and distinct from one another that there was evoked from them a reptile, twelve feet in length, a creature covered with large bony scutes, with an incredibly long, cruel snout, armed with serrated teeth. At first sight he looked like a crocodile, especially one of the slender-snouted gavials, those terrors of the Ganges. This dramatic find was the first Triassic New Yorker, our Oldest Inhabitant.

He was christened *Rutiodon manhattanensis*, which, eased into the vernacular, means the Manhattan Grubber. In life the Grubber was essentially a sprawler and swimmer, but in one decisive way he differed from living crocodiles; his nostrils were placed far back near his eyes instead of being at the tip of the snout. The teeth at the very tip were elongated and curved, so that the whole jaw has been compared to an elongated pair of tongs with nippers at the end. This



The Manhattan Grubber was primarily a sprawler and a swimmer but it differed in one curious way from the modern crocodile which in many other respects it resembled—its nostrils were near the eyes, not at the end of the snout. Drawing by Helen Tee-Van.

little assemblage of characters shows that in the probable absence of large fish and other toothsome inhabitants of the swamps and ponds, the Grubber had to grub for a living. With his nostrils so far back, he could feel about and burrow in the muddy banks, and seize the giant worms and other life, without any hindrance to his breathing.

And so, almost at the very spot where we are sitting on the Palisades, opposite New York City, a hundred thousand times as long ago as the duration of our calendar, the Grubber lived and splashed and ate and fought.

We enter our little bug-automobile and return to the Zoo with varied thoughts and emotions, some of them decidedly humble.

Charles Haskins Townsend

By FAIRFIELD OSBORN

DR. TOWNSEND was a man of strong and salty personality. He was short of stature, but tough and wiry. His face never lost the weather marks of his earlier long years at sea. His direct gaze was characteristic of a man who had spent much time in the open—eyes that had searched distances.

He was of that school of naturalists which, in this period of specialization, is too greatly diminished. He had no high regard for laboratory scientists. "Technical fellows," he called them—"too damn technical." He defined a naturalist, with warmth in his voice, as one who "finds and describes," while a scientist merely "takes and explains." In fact, he felt so strongly on this score that some of the staff who were doing important research work, much of it vital even to the successful operation of the Aquarium itself, had almost to do this work under cover. Yet he himself was wonderfully well informed and trained, having learned through the school of practical experience.

He was born at Parnassus, Pennsylvania, in 1859, the son of a minister. While still a school boy he decided "to go in for" natural history. At the age of twenty he took a job in Ward's Natural Science Establishment in Rochester and three years later became a junior on the staff of the Academy of Natural Sciences in Philadelphia, where he worked principally in ornithology. Through connections made at that time, he was appointed to the United States Fish Commission and sent to the salmon hatchery on the McCloud River, California. Three years later he participated in a survey trip up the Kowak River in Alaska, using the U.S.S. *Corwin* as a base. This Government expedition had much to do with

Some thoughts on the personality of the man who directed the Aquarium for 35 years. When he died, animal life lost a true and forthright friend.

establishing conservation measures for reindeer, which at that time were approaching extinction. Then came eleven years of ocean and coastal cruising aboard the U.S.S. *Albatross*. This experience proved a most fruitful one and led to his appointment in 1897 as Chief of the Division of Fisheries of the U.S. Fish Commission. During these years in Government service he had acted as Assistant Government Commissioner in salmon propagation and as a member of the Bering Sea Fur Seal Commission, in which activity he contributed to the eventual signing of an international agreement preventing the wanton slaughter of seals. In 1902 he joined the staff of the Zoological Society as Director of the Aquarium.

Dr. Townsend's career is so generally known and so many of his activities and accomplishments have been reported in the Society's publications over the years that it would seem of greater interest here to write of him more intimately.

The staff at the Aquarium used to call him "the old man" and he always referred to the men as "my boys." Like most men of strong personality, he had several idiosyncracies which added to the savor of his character. He abhorred seeing anything wasted. He was always saving pieces of string. His collecting and saving habit resulted in a great accumulation of all kinds of odds and ends in the attics of the Aquarium and of his home and barn in Westchester. He always took



At his desk in the Aquarium in Battery Park Dr. Townsend was never as much at home as in more active surroundings—on a field trip or aboard some sea-going vessel. There he really expanded.

keen satisfaction in the fact that at the end of the year he was able to turn back to the Society at least some money from the budget that had not been spent on Aquarium operations. The story runs that he used to keep an eye out of his tower window at the Aquarium and occasionally, when he spotted some lumber débris floating down the Hudson, would order the boys out in a boat to fetch it in. "Many mickles make a muckle," he used to say. His fondness for the sea was reflected in his everyday conversation with the men. At the Aquarium he gave his orders in nautical terms.

He took pride in the collecting sloop *Sea Horse*, which was built under his direction. He enjoyed inviting his many Navy friends aboard for collecting trips to Sandy Hook. Once when he had an Admiral friend of his aboard, a storm came up. The boat rolled and rocked so that the Admiral became violently seasick. Dr. Townsend stood on deck, taking the blow like a real old

salt, smoking his little stogey cigar.

His knowledge and observations of aquatic birds resulted in his insistence that numbers of these be exhibited at the Aquarium. The odor of these collections in the poorly-ventilated old building did not deter him in the least—the public had to see them. If the stock ran low he would occasionally supplement it by fishing for sea gulls off Battery Park. The method was simple enough. A dulled hook baited with a piece of red flannel would be swung through the air by means of a long fishing pole. The sea gulls would dive and take the bait. He had an almost sentimental objection against clipping the flight feathers of a bird, to say nothing of pinioning one. He expected the men on the staff to make the bird so content in its new environment that it would not fly away, and threatened that if a bird were lost the man responsible must pay for it.

He was quite a good taxidermist and had a fine collection of bird skins which he had prepared

himself. A tortoise was once sent in to him for study and preparation. The carcass was stored in a basement room and after a couple of weeks he went down to look at it. On this particular day he was in a hurry to go to a Board of Trustees meeting but he wanted to do some work on the tortoise before he left. He asked Callahan, one of the men, to get the animal out on the table for him. The flesh was so decomposed that there was a frightful stench. Nevertheless, the Doctor insisted that the turtle be laid out on the table for him and as soon as this was done he began to dissect away. The odor was so bad that it overpowered Callahan. Dr. Townsend shoved one of his stogies in Callahan's mouth and said, "Here, this will fix you up." He worked for an hour or so, the whole room reeking, and then rushed off to the Board meeting.

Dr. Townsend often referred to the fact that he was able to change the Aquarium from "an over-sized bathroom to an Aquarium." He used to say that "we give the public the best show in the world for nothing." As a matter of fact, he was not far wrong, because during his 35-year tenure as Director of the Aquarium, it was visited by more than seventy-four million people and became known the country over as one of the five "musts" to see in New York.

The fact is that he worked miracles with the Aquarium from the day he took charge. In these days when we are planning great changes in the Zoological Park, together with a new Aquarium, it is too easy to forget what our predecessors accomplished. All kinds of innovations and methods of operation were installed under Dr. Townsend's direction and there is nothing truer than to say that we would not be in our present position without the knowledges which men like Dr. Townsend and Dr. Hornaday developed.

Dr. Townsend, alluding to the fact that his father wanted him to become a minister, semi-humorously claimed that he was a divinity student who went out for a one month trip on the S.S. *Albatross* and did not come back for eleven years.

Once Dr. Townsend got hold of a cause or an idea he never let go. His interests were wide-ranging. In 1928 he went to the Galápagos Islands and became captivated—there seems no

other word — by the giant Galápagos tortoises. Their protection from then on became a passion with him. With great difficulty 115 of the animals were carried away and established in breeding stations through the South and Southwest, as well as at Bermuda. The continuation of these species became for him more than a crusade. The animals were uppermost in his thoughts. Meetings of the Board of Trustees for years were illuminated by his "Galápagos Tortoise Report," which was presented in considerable detail and with an immense amount of zeal and enthusiasm. The fact that the Board the year before had heard quite a similar report was entirely beside the point — the Galápagos tortoises had to be saved!

He was tireless in his researches on any subject that interested him. Probably no man knew more about whales than did he. His methods of study were practical and to the point. He prepared a voluminous amount of data on whales of various species and, in order to get his base material, waded slowly and meticulously through countless logbooks of early whaling vessels, which he found in the libraries of the former New England whaling centers. From the data accumulated he plotted charts indicating the distribution of these animals in the Atlantic and the Pacific Oceans. This information is even today the most complete of its kind.

Dr. Townsend was not afraid to consider and to seek for understanding of the entire realm of the living world and he had knowledge of a surprisingly large proportion of it. Although his reputation was built around fishes and other marine life, he really knew a great deal about mammals, birds and invertebrates. Despite his verbal sallies on the subject of "scientists," he published a large number of scientific articles, all written with great competency. His publications are marked by a faithful recording of observations keenly made, often accompanied by an historical slant that gives them both charm and value.

In thinking of Dr. Townsend, one realizes that an institution acquires its character from the men who through the years have worked in its interests. Dr. Townsend's personality, his knowledge and his methods are a part of the Society today and will continue indefinitely into the future.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

CHECKING UP ON JOEY

Authorities differ so considerably in their reports on the length of time between the birth of a baby kangaroo and its emergence from the maternal pouch that we have begun to make our own observations. Kangaroo babies of various species are a fairly regular occurrence in the collection and over a period of a few years we should be able to settle the matter to our own satisfaction, at least.

The present "Joey" under observation is a Wallaroo-Euro hybrid. Thanks to the careful notes of Keeper James Rimmer, we know that 5 months and 11 days elapsed between the time the baby was born and the first occasion when it put its head out of the pouch. Several more weeks or even months may elapse before it actually gets out of the pouch. Keeper Rimmer will report the event when it occurs.

It may be found, as other species are brought under observation, that the period in the pouch varies from species to species.

THE PASSING OF OLD NELLIE

The death of an animal that has been in the collection a long time, even if its tenure has been quiet and undistinguished by any temperamental outburst, always leaves a keenly felt gap. We find ourselves in that position in regard to the passing of Nellie—Old Nellie, as she had come to be called, to set her apart from a Young Nellie—the Griffon Vulture who had the honor of being the oldest inhabitant of the Zoological Park.

Nellie was found dead in her winter home in the Ostrich House on the morning of February 19. She had come to the Zoo on August 23, 1902, and consequently had been with us 41 years, 5 months and 27 days, to set what is possibly a world's record for longevity. The best previous record as set down by Major S. S. Flower was some 37 years established by a Griffon Vulture in the Copenhagen Zoo.

Only last fall we had celebrated Old Nellie's forty-first birthday by spreading a picture of her head across the cover of *ANIMAL KINGDOM*. At that time she scarcely showed her age and we were able to remark that she looked good for many years more. Her chief disability in recent years had been a bad case of "bumblefoot," a swelling of her feet that incapacitated her for exhibition, since she developed the habit of sitting at the front of her cage with her unsightly feet stretched toward the public. In 1940 she was removed from exhibition and turned out in a large paddock in the southern part of the Zoo, and was removed to the Ostrich House each winter.

Young Nellie, her successor in the collection if not in our affections, came to us on January 8, 1925, and thus has accumulated 19 years toward Old Nellie's record.

A BARGAIN IN BOOKS

While taking inventory recently, the Publication Department discovered a number of copies of "The American Bison," by Martin S. Garretson, published by the Society, which had been warped and slightly damaged by damp. While they last they are offered to Members at 50 cents each. Send order, with payment, to Publication Office, Zoological Park, New York 60, N. Y. All copies sold "as is"—which means that we simply pick them off the shelf and mail them out, warps and all. Most copies are in reasonably good condition and they are a real bargain. Publication price was \$2.50.

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since the last issue of this magazine are the following:

Founders in Perpetuity
Dulaney Logan

Research Associate
Dr. C. M. Breder, Jr.

Annual

Harold C. Amos
Mrs. Elliott Averett
Miss M. Patricia Dunn

Fernando A. Rubio
Pierre Ruedin
Mrs. Alice B. Pioselli

Mrs. Paul M. Warburg

Three Tiger Cubs

By LEE S. CRANDALL

IN ANY well-organized collection, young animals are expected to be born and their appearance becomes more or less a matter of routine. Some, such as hardy range species, are cared for by their mothers with no particular attention from their keepers. Others are reared with variable degrees of difficulty but many are such problem children that they are not reared at all.

For us, at least, tigers have always been in the latter category. Never, in all our history, has a tiger cub been reared here. In fact, very few have been born. A search of our records reveals that up to 1943, only four infant tigers have been produced in the Zoological Park. In 1905 and again in 1915, single Bengal cubs were born, and in each instance died on the same day. In 1912, our beautiful pair of Siberians produced a litter of two, which met the same fate.

Dismal though this result may be, it is a fair cross-section of Zoo experience with tigers. For some reason, the long-haired Siberian form seems a little more reliable and the well-known pair in the National Zoological Park in Washington D.C., which reared six young over a period of several years, and the magnificent stock for which the Detroit Zoological Park is noted, come immediately to mind. Bengals are bred here and there, of course, but I must say that in my own experience, the only naturally-reared young of this form that I can recall seeing were in the chalk-pit den at Whipsnade, London Zoo's country establishment.

So when, in 1934, we bought a young female Bengal tiger from Henry Bartels, we made no effort to secure a mate for her. Through the vagaries of the animal market, it was 1941 before a male Bengal was obtained. Anteriorly, this is an extremely fine animal, very tall and with a beautifully molded head. Aft, however, he is definitely below par, rickets or an old injury having destroyed any early ambition he may have had to grow up with a straight back.

After the necessary period of rubbing noses through a wire partition, the two animals were allowed to occupy one of the large cages in the Lion House. Because of the physical imperfec-

tions of the male, there was no real expectation of breeding results so when, on January 19, 1943, a dead cub was found in the den, we were taken entirely by surprise.

Preparations were made for the arrival of the next litter and the animals were separated well in advance of the expected event. The gestation period for tigers is usually given as "90 to 110 days" and "Jenny" settled the question cleverly enough, for after exactly 100 days, faint squeakings were heard in her sleeping den.

Bengal tigers that will care for their young in captivity are rare and the only way to find out whether or not we had one, was to let Jenny try. And for four days she did her best, coming out of her box only to lap her milk and to drag in her bountiful allotment of raw horse meat. On the evening of the fourth day, the baby mewings were obviously growing weaker and next morning they had ceased altogether. Jenny was tricked into leaving the den, the sliding door was drawn and the den was entered from a passage below. A single emaciated cub was found, quite dead.

It looked then as though Jenny was not to be our pearl among tigers. By that time, she had been with us for nine years and must have been at least twelve years old, a point in the life cycle beyond which a tiger cannot be expected to improve. The animals were kept in separate cages while we pondered the situation. By late autumn, our plans had matured. We would place a nest box just in front of the inner door of the sleeping den, accessible only by the help of a 12-foot ladder. We would examine the cubs as soon as they had been born, without the necessity of entering the den, and remove all but one to be reared by hand. And we would prepare a pair of new cotton gloves, well scented with the essence of tiger, so that no odor of man would be left to disturb the mother.

The parents were reunited and in due time, early on the morning of February 8, 1944, infant squalls were heard again. And now for our plan. Everyone knows what usually happens to wonderful plans — only this one worked! Once Jenny had been coaxed out and locked out, the ladder was climbed, the door was opened, tiger-scented gloves lifted out two lovely, mewling cubs. Quickly, Dr. Goss determined them to be male and female, and after hasty consultation, we de-

The baby tigers were five weeks old when this photograph was taken in Mrs. Martini's home and it shows the size and agility of the youngsters—already so active that their play pen will not hold them.



cided to lift the male and leave the female with its mother.

Carefully wrapped in heated towels, the baby was rushed to our Hospital, where Dr. Goss found its weight to be two pounds eight ounces, and its length, from tip of nose to tip of tail, twenty inches. It was then taken to the nearby apartment home of Mrs. John ("Fred") Martini,

wife of the efficient Keeper in charge of our Lion House. Mrs. Martini had already had a successful experience in rearing a lion cub and joyfully welcomed the baby tiger, which she promptly named "Raniganj."

Two hours later, Fred reported that he thought he could hear two tiny voices in the den. Following our routine with practised ease, we quickly

entered the inner chamber and found that a third cub had been born. Since the newcomer was a male, we this time took the female, leaving the last born to the mother. This cub weighed two pounds eleven ounces and had the same over-all measurements of twenty inches. Mrs. Martini named her "Dacca."

For the remainder of that day and two more, we watched the mother carefully, not daring to inspect the den for fear of disturbing her. On the evening of February 10, the cub's voice was obviously growing weaker and we determined that if there was no improvement by morning, we would remove it. Bright and early, Fred Martini began his vigil but by 9 A.M. had heard nothing. We then entered the den and found an emaciated little creature, cold and almost motionless. Without stopping for weighing, we rushed him to the only possible haven, Mrs. Martini's apartment. Jenny would be disconsolate for a day but there was just a chance to save the baby's life. Undismayed, Mrs. Martini called him "Rajpur" — just so he would not die unnamed — and laid him on a heating pad. Soon, he began to wriggle weakly; in two and one-half hours, he took his first meal. We found that while Rajpur adhered to the standard length of twenty inches, he was much stouter and heavier in bone than any of the others.

First food for the cubs consisted of one-third evaporated milk and two-thirds water, heated to body temperature. They took from two to three ounces at each feeding, every three hours, from 6 A.M. to midnight, drawing it vigorously through a rubber nipple. At first, they were kept together in a cardboard carton, carefully padded and covered, with the heating pad attached to one side so that there was no danger of overheating. Soon, however, it was found that the little mouths would attach themselves to anything they touched and because of the risk of injury, a box for each was provided. For short periods, under close surveillance, the cubs were allowed to crawl about in a padded play-pen.

Careful notes on progress were kept by Mrs. Martini and most of the following data were culled from her diary. When nine days old each cub weighed exactly four pounds. At fifteen days, Rajpur weighed 5 pounds 10 ounces, Raniganj,

5 pounds 8 ounces and little Dacca 5 pounds 4 ounces. On March 14, when the cubs were exactly five weeks old, they had achieved the following: Rajpur, 9 pounds 3 ounces; Raniganj, 7 pounds 6 ounces; Dacca, 8 pounds.

The eyes of tiger cubs are closed at birth, of course, and those of our babies opened at varying times. Dacca was first and separated one pair of lids in nine days, although the other eye did not open until four days later. Both little males opened one eye when eleven days old, and the other two days later. At five weeks, while definitely able to see, the eyes are still blue.

When ten days old, all three cubs were found to have their upper teeth just breaking through the gums. They were cross and irritable for two or three days but soon regained their good nature.

On the eighteenth day, all of the cubs gave evidence of digestive disturbance. This went on for several days and finally became so serious, at least in the case of little Raniganj, that we despaired of saving him. He became too weak to feed from the nipple and Mrs. Martini had to resort to a medicine dropper. In these desperate straits, Dr. Goss decided on desperate measures and injected 15 cc. of homologous feline distemper anti-serum, in lieu of a blood transfusion. Little Raniganj responded beyond expectations and within fifteen minutes was crawling in the play-pen, bawling for food. From that day, he has never looked back. A speck of bismuth here, a teaspoonful of lime water there, a mild increase of food all around, did equal wonders for the others. At five weeks, they are lovely and we believe now that Mrs. Martini will score another triumph.

Even at this tender age, the little tigers are remarkably different in temperament. Raniganj is definitely bad-tempered, squalling, biting and scratching whenever any infant wish is balked. Huge Rajpur is fat and indolent, willing to accept whatever comes — especially food! Little Dacca is happy, bright and friendly, though ready to defend herself against her larger brothers, as they romp in the play-pen. Can these apparent indications of forming character be expected to forecast adult natures? Let us hope that we shall know!

ANIMAL KINGDOM



BULLETIN, PUBLISHED BY
NEW YORK ZOOLOGICAL SOCIETY

THE BIRTH OF A BABY PLATYPUS IN AN AUSTRALIAN SANCTUARY, *By David Fleay* • ANIMAL
ILLUSTRATIONS THROUGH THE AGES, *By Walter J. Wilwerding* • NEWS AND NOTES

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York 20, N. Y.

PRESIDENT

Fairfield Osborn

FIRST VICE-PRESIDENT

Alfred Ely

SECOND VICE-PRESIDENT

Laurance S. Rockefeller

SECRETARY

Harold J. O'Connell

TREASURER

Cornelius R. Agnew

EXECUTIVE COMMITTEE

Fairfield Osborn, *Chairman*

Cornelius R. Agnew
Alfred Ely
Marshall Field

De Forest Grant
Warren Kinney

Harold J. O'Connell
William De Forest Manice

David H. McAlpin
Robert Moses
Laurance S. Rockefeller

BOARD OF TRUSTEES

Class of 1945

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely

Marshall Field
Childs Frick
Archer M. Huntington

David H. McAlpin
John H. H. Phipps

Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Class of 1946

George Gordon Battle
George C. Clark
F. Trubee Davison

Jay Downer
Robert I. Gannon

Robert Gordon McKay
Fairfield Osborn

Laurance S. Rockefeller
John M. Schiff
Frederic C. Walcott

Class of 1947

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez

De Forest Grant
Eugene Holman
Warren Kinney

Henry R. Luce
William De Forest Manice
Harold J. O'Connell

Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Ex-officio, The City of New York

The Mayor, Hon. Fiorello H. LaGuardia

Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

John Tee-Van *Executive Secretary*

Jean Delacour *Technical Adviser*

Sanford Miles *Comptroller*

William Bridges . . . *Editor & Curator, Publications*

Claude W. Leister *Curator, Education*

ZOOLOGICAL PARK

Lee S. Crandall . *General Curator & Curator of Birds*

Claude W. Leister *Associate, Mammals*

Leonard J. Goss *Veterinarian*

John Tee-Van *Associate, Reptiles*

Grace Davall *Assistant to General Curator*

W. Reid Blair *Director Emeritus*

William Beebe *Honorary Curator, Birds*

AQUARIUM

Christopher W. Coates . . . *Curator and Aquarist*

C. M. Breder, Jr. . *Research Associate in Ichthyology*

Ross F. Nigrelli *Pathologist*

George M. Smith . *Research Associate in Pathology*

Myron Gordon *Assistant Curator*

Homer W. Smith . *Research Associate in Physiology*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*

Jocelyn Crane *Research Zoologist*

Henry Fleming *Entomologist*

George Swanson *Staff Artist*

Associates

William K. Gregory
John Tee-Van

Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

VOL. XLVII

JUNE 2, 1944

No. 3

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York 20, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York 60, N. Y. Title registered with United States Patent Office.

Subscription, \$1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

Conservation and War

At this hour of climax of man's destruction of his fellow man, any words concerning conservation in general, or the preserving of wild animal life in particular, seem but as whispers in the wilderness, faint sounds and meaningless, lost in the whirlwind of human conflict. One could not expect, one can scarcely hope for kindness in days so cruel.

It is worth recalling, perhaps, that conservation is of two elements — on the one hand practical, being the purposeful conserving of natural resources for man's own benefit; on the other hand, esthetic and moral, involving both the protection of the beauties of nature and the trusteeship of the heritages that nature has placed in man's hands.

Could it be that because of its moral aspect one is justified in hoping that conservation may not be lost to sight, even during these dread days? If so, it is because conservation may be thought of as a symbol — a symbol of kindness which, denied for the moment as between man and man, can be extended to other living things, mute and without anger. These wild living things once destroyed will never appear again, but if protected, will, in the better days to come, be a continuing delight to us and to our children through all time.

Fairfield Osborn

IN THIS ISSUE

Prairie Dogs	COVER
The Birth of a Baby Platypus	David Fleay 51
A Short Account of Zoological Illustration	Walter J. Wilwerding 70
Behind the Scenes: News and Notes	78



“Corry,” the baby platypus, at the age of sixteen weeks. At this time she was thirteen and a half inches long and four days after this picture was taken she entered the water for her first aquatic excursion. The baby is being held by the author, David Fleay, director Australia’s platypus sanctuary.

The Birth of a BABY PLATYPUS

By DAVID FLEAY

*Director of the Badger Creek Sanctuary,
Healesville, Victoria, Australia*

Here is the fascinating story of the first Ornithorhynchus ever to lay an egg and successfully hatch a youngster in captivity, told by the Director of Australia's famous sanctuary.

FOR NINE YEARS, three in the Melbourne Zoological Gardens and six at the Badger Creek Sanctuary, I have striven to bring about conditions conducive to the laying of eggs and successful rearing of young by our shy and temperamental duck-billed platypus. It was obvious that many interesting little details of intimate habits denied to Mr. Harry Burrell during his very thorough compilation of platypus lore could only be revealed when a truly domesticated "duckbill" consented to perform her duties as a mother.

In this 1943-44 season, after years of trial and error, high hopes, and great disappointments, Fortune really smiled, and Jill, wife of Jack, the platypus, made history by hatching and rearing a splendid female youngster.

Before proceeding I would like to acknowledge the debt owed in these investigations to Mr. Karl Byron Moore of Melbourne, a member of the enthusiastic Sanctuary Committee, who, knowing the tremendous expense involved in procuring the necessary quantity and variety of food for the pair of platypuses, has assisted financially each month throughout the difficult years of this war. In days when even our butcher's order had to be dropped in favour of using up ancient bony horses, it is doubtful whether the platypus experiment could have been carried on but for Mr. Byron Moore's very practical help.

There must also be remembered the steady conscientious assistance of my deputy, Mr. Cecil Milne, who has never spared himself in the many and varied duties involved in caring for the welfare of our Ornithorhynchus family. Mrs. Jemima Dunolly, too, last of the old aboriginal people at Coranderrk, supplied us consistently in all weathers for years with the important platypus food items until practically the day of her death in early January, 1944, at the reported age of 102.

In the *Victorian Naturalist*, Vol. LIX, No. 11, March, 1943, the ways of Jack and Jill, their places of capture and many vicissitudes, were described. On this day of commencing my further record (February 19, 1944) Jill has completed six years in captivity, and as she began her life in the Sanctuary at the nest-leaving stage, her age on this date is roughly, but fairly accurately, six years, three and a half months. This fact plus her bright, alert ways and excellent health, despite the constant demands of her youngster, are clear indications that the life of the platypus is a lengthy one.

Jack, whom we captured in Badger Creek a year later than Jill, as a half-grown youngster, is approximately the same age as his mate, and this big, richly-coated animal, 20½ inches in length and weighing 3¾ lbs., now has more than five years in a Platypussary to his credit.

With the object of providing a suitable small-scale "river bank," wherein Jill at her chosen time could excavate a breeding burrow, hard packed earth and logs had been arranged in an enclosed area at the western end of our Badger Creek Platypussary since early 1939. Variations

in the mode of entry to this section from wooden "tunnels" running to the swimming tank had to be devised from time to time; the excavated earth had to be carefully removed as Jill brought it out and the relations between the lady and her mate, who was almost double her weight, had to be most carefully watched.

With all our well intentioned architecture and experimentation with the all-important balanced diet, it seemed that only during the winter of 1943 were conditions brought to such a state that they met with Jill's unqualified approval.

Small, even for a female platypus, Jill measures $16\frac{1}{4}$ inches (average = 18"), weighing a bare 2 lbs. in her fattest condition, and her extraordinary tameness is largely due to the fact that, owing either to undernourishment or possibly to some accident having accounted for her mother, she left the nesting burrow at a very immature state—being then no more than 10 inches long, the smallest young platypus in the free state that I have ever seen. Compare this with her own youngster, which at the length of $13\frac{1}{2}$ inches was still in the nesting burrow. Thus Jill's early impressionable weeks and months were our own, to instil into her the necessary trust and confidence. Little did Mr. Vince McCrohan of Healesville think, when he picked up the tiny and very weary Jill ambling down a hard mountain road three-quarters of a mile from water, that she would later create a stir even in wartime London.

The happy result of Jill's early education is that she has absolutely no fear of human beings, even when they crowd about her in hundreds, and unlike the general run of platypuses she is little inhibited by the traditional temperament. In fact, recently when I tied her in a bag to ascertain her weight, she resumed feeding immediately afterwards as if nothing had happened.

Jack, the male platypus who was captured after months of free life, became very quiet and accepts food by hand, but he has never been the friendly and frolicsome little pet that Jill is.

In the cases of both animals the success in breeding was not brought about by shutting them away and leaving them strictly alone. The daily exhibition with a general alternate day appearance of each (unless Jill happened to be hibernating) went on much as usual right un-

til the famous October day when Jill actually gathered nesting material under the eyes of spectators and began to construct her nursery. Naturally, thereafter Jack had to represent the family at 3:30 p.m., each day, but even so Jill appeared on many occasions in succeeding weeks on daylight foraging excursions as I shall describe, and Jack was able to enjoy periods of well-earned rest.

Normally crepuscular and nocturnal, platypuses in Victorian streams are rarely seen during daytime unless flood waters are high, food is scarce, or females are engaged in caring for infant families. The usual thing is to find the animals slipping out into the streams during the evening light and swimming continuously up and down stream practically the whole night through.

Three years ago while engaged in procuring five pairs of platypuses for liberation in the streams of Kangaroo Island by the South Australian Government, it was particularly instructive at night to illuminate by means of a powerful spotlight the shallow rapids of such Healesville streams as the Watts River and Chum Creek, and observe the underwater "swim-past" of a number of otherwise unseen duckbills on their various lawful occasions.

The most usual indication of their presence when one is quietly sitting on a river bank at night is the sudden "splash-dive"—an almost double sound characteristic of the platypus alone. This alarm signal, like that of a rabbit or wallaby thump, conveys its meaning almost simultaneously to any other platypus in the vicinity.

In view of the typical nocturnal habits of the species, the behaviour of Jill, which has been most consistent over the past two seasons, is of exceptional interest. Jack, not being concerned with procuring food or preparing himself for incubatory duties, broke his nocturnal emergences on but a single occasion during the pairing month of October, 1943.

Skipping, then, the notes made over several past years I shall describe Jill's movements from the day they departed from normal in 1943, just as they did in the preceding year of 1942. In the winters of these two years, and, in fact, at odd times during those even before that, Jill had disappeared for periods of several days at a time



H. G. Wells visited the platypus sanctuary in 1939 and was so entranced by the little animals that he was allowed to hold Jill. Incidentally, destruction of the sanctuary by brush fires was narrowly averted two days later.

deep in her burrows. There is little doubt that these absences were stretches of hibernation or sleep during the coldest and bleakest periods of the year, and they may be in the case of the female animal part of the preparation for the incubation period to come. At such a time she pugged up or blocked up her camping chamber from its connection with the water. Jill is not the only platypus I have known to hibernate.

Harry Burrell ("The Platypus," page 164) says: "Although Bennett has made the suggestion that *Ornithorhynchus* hibernates, my investigations do not bear him out. In New England district of New South Wales, the pairing season commences in July which is the mid winter month on those cold highlands. The platypus lives an active life the whole year through." Bennett's statement read: "These creatures are seen in the Australian rivers at all seasons of the year, but are most abundant during the spring and summer months, and I think a question may

arise whether they do not hibernate."

Robert Eadie ("The Life and Habits of the Platypus") recorded periods of hibernation during the months of June and July for his famous pet platypus "Splash," a male animal. There is no doubt whatever that in Victoria platypuses do hibernate for greater or lesser periods and my field observations agree exactly with those of Bennett. Unless a platypus in captivity has access to earthen burrows of its own construction it will not always hibernate, since it is possible that such periods of retirement, plus ensuing stretches of ravenous eating in the case of the female, are correlated (as suggested) with the nesting period. I have tabulated the following account of Jill's 1943 winter behaviour. The summary indicates the dates and periods of time, apart from ordinary nocturnal emergences, spent inside the burrowing bank with the animal "pugging" or sealing herself in — to use the mining term so appropriately adopted by Mr. Burrell.

DATE INTERVALS.	APPROXIMATE TIME SPENT IN RETIREMENT.	ENSUING FEEDING PERIOD.
May 28, 1943.	One night and day—(24 hours).	Out at night.
May 31-June 1.	Two nights and a day. (36 hours.)	Out two succeeding days all day and sleeping at night.
June 4.	One day and night. (24 hours.)	Out all day.
June 7.	Two nights and a day. (36 hours.)	Out two succeeding days all day and sleeping at night.
June 12-June 19.	156 hours.	Emerged for half a day—12:30 p.m. until dark. Fed all next day, and for several days with nights in retirement.
June 24-June 26.	36 hours.	Fed all day for two days—away at night.
June 28-July 3.	120 hours.	Out all day for four days. Nights in retirement.
July 6-July 12.	132 hours.	Fed all day for five days. Away at night. Extra hungry.
July 17-July 21.	102 hours.	Emerged in early afternoon. Fed 6½ days consecutively. Away each night.
July 28-Aug. 2.	120 hours.	Emerged 4:30 p.m. Fed until well into night. Out in afternoons for several days and for several other whole days—away at night.
Aug. 8-Aug. 13.	120 hours.	Appeared 3 p.m. Fed into night. Out with little variation for seven days running. Away at night. Three more half days staying into night.
Aug. 25.	24 hours. Away during a day and night.	Out all day three days running. Away at night.
Aug. 29.	One night and day. (24 hours.)	Fed in daylight two following days. Away at night, emerging after midday in each case.
Sept. 1-Sept. 3.	92 hours.	Emerged 4 p.m. Out most of day for three following days. Away at night. 4th and 5th days out from 3:30 p.m. Away at night.
Sept. 10-Sept. 15.		Jill out each day all day, away sleeping at night.

Another interesting thing was the fact that from this period on, for the first time in 1943, the end of Jill's tail took on the bare and patchy appearance that so commonly develops each year. This, of course, was a direct result of using the tail in back-pushing soil to close off unwanted passages and working up blocks or pugs. On emerging from her various absences, Jill became definitely diurnal and could usually be seen feeding ravenously all day long. It was a common sight on such occasions to watch her working away in patches of mud below water with her ever-requesting bill, and when on a good prospect, flailing hard with both "fore-paddles" in unison to stir up small delicacies from obscure crannies.

It will be noticed that the hibernation periods began towards the end of May and ended just before mid-September.

From September 15 onwards Jill gave no further indication of any periods of hibernation but her appearances in daytime continued more regularly than previously. With few exceptions

she now appeared in the afternoon (from 3 p.m. onwards) and fed into the night.

In the 1942 season when no pairing was observed and evidently none took place, Jill's habits returned to normal in late October, and from the 23rd of that month onwards (the end of the mating season) she became once more a nocturnal creature sleeping by day and appearing at dusk to feed through the night.

The most interesting observations in this 1943 season, as in the preceding year at a corresponding time, lay in the prodigious Spring appetite displayed by the vigorous creature. Following her three months of on-and-off hibernation during the intervals of which she ate very heartily indeed, she now (from early September on) devoted herself to banqueting of a much more intense nature. From the time of her afternoon bow to the public (coming out of her own accord) until far into the night, she devoured grubs, yabbies (fresh-water crayfish), beetle larvae, worms and tadpoles with little pause, coming out each and every day. In view of the story yet



Jack, the father of the baby, is arriving at one of the landing stages in the platypus pool. This big fellow is twenty and a half inches long and weighs three and three-quarters pounds. He has well-developed venom spurs. Note the folded fore feet, with his weight resting on his knuckles. Jack is about the same age as Jill.

to be told, it will be seen that this performance was a preliminary "storing-up" in preparation for the domestic activities so close at hand.

Throughout all these months Jack had inhabited the same home and swimming pool as Jill, but he had not been permitted to enter her bank of earth. He showed no inclination to hibernate, did not come out to feed during daylight, and fed as usual throughout the nights. I am not inferring that the male platypus does not indulge in periods of winter hibernation. Jack has never done so but it must be remembered that he has not been permitted to excavate his own burrows. The adult male platypus is also far more difficult to observe in the wild state than the female, for these big "old men" are far more suspicious and retiring than the females.

In a long period of observing and capturing platypuses in various Victorian streams ranging from the Western district to Gippsland, I have only once managed to hoodwink a fine big fellow like Jack, whereas young males and immature and fully grown females are fairly easy game.

Returning, then, to the mid-September period of 1943 by which time Jill had ceased her bouts of hibernation, but still continued to feed by day, it happened on the 14th of that month, during an afternoon show featuring Jack (who had been brought from his "burrow" for display), that Jill slipped forth from her tunnels and began begging for special items of food. This she does by waving her beak jerkily above the water surface, and repeatedly emerging from underwater dives in the corner nearest the hand holding the food. Accordingly some beetle larvae were proffered and she reacted eagerly by clinging to the hand that approached her and levering its fingers apart with her bill.

After a few minutes it was noticed that Jack seized Jill's tail in a firm grip with his bill and the two animals swam slowly in a processional circle. The period between mid-September and mid-October was evidently the pairing season, and several instances of courting actions with the two animals swimming in a processional circle were noted during that time. Jill (as previously mentioned) continued her daylight feeding sessions, occasionally varying the procedure by appearances at night. Apart, however, from the rather interesting evidence of this play at court-

ing, the first true act of mating was observed on October 11.

During the afternoon fairly heavy rain fell and at 3:30 p.m. both animals were in the water of their own accord — Jack, the male, of his own volition in broad daylight for the only time noted in his five years at the Sanctuary. In view of Mr. Harry Burrell's notes and theories on one use of the platypus spur as a means of holding the female during copulation (Burrell, Chapter 7), it is worth recording that during this act, when the animals were fast for nearly ten minutes, no spur grip was noted. A good deal of splashing and floundering about occurred, and in the first place the male animal doubled his body under while maintaining his grip on the female's tail with his bill. No further activities of this kind were noted.

Jill fed on ravenously each day, if anything coming out even earlier (about 1 p.m.). On October 18, it was decided to remove Jack and give him the run of a new Eastern section or wing of the Platypussary, which was shut off from Jill's Western quarters. Jill became more and more hungry. She was often seen now at 9 a.m., feeding continuously right through to 9 p.m., and for hours after that. Down she would dive time after time to weave her blind way about on the bottom, seeking palatable items, rising then to the surface for a leisurely chewing and continual bulging of her cheek pouches. I supplied her with duckweed and other aquatic plants, thinking that green vegetation might be in demand at this particular time, but all to no purpose.

On October 22 her actions were decidedly restless. She had for a week or more beforehand changed her entrance hole from the water to one leading out on the Northern side of the Platypussary and had excavated a fresh entrance-burrow high up in her burrowing bank. On this day she emerged at midday, disappeared again at 3 p.m., reappeared at 4 p.m., and again retired at 6 p.m. Possibly, in view of her further activities and the amount of earth thrown out, she was working on the nesting chamber at the burrow terminus.

Weighty support for this theory appeared on the following day (October 23). Jill was ready to build a nest! On that memorable occasion

quite a crowd was present and what a treat was afforded them! However, probably not one spectator realized the unique nature of the occasion. I happened to notice that Jill was not inclined to feed and she appeared to be more interested in making repeated snatches at a leaf fragment in the water. I gathered a handful of dry eucalypt leaves and dropped them in the water. Immediately the lively little animal seized upon them with her bill. With feverish energy she ducked her beak below and under her body, at the same time bending and tucking her tail forward so that the leaf became held in a neat tail grip almost identical with the mode employed by both nest-building ring-tailed 'possums and 'possum gliders of the genus *Petaurus*.

Again and again leaves were transferred below water to the grip of the tail, and as the bulk grew the platypus's hind feet were used to kick the bundle back into a more compact roll. It was a most amazing sight and I have often, figuratively speaking, kicked myself since for not taking photographs. All thought of food forgotten (which in a platypus of Jill's calibre was unprecedented), the little nest-builder swam towards her Northern burrow entrance again and again with her tightly-held leaf bundle, and scuttled inside. There was no hesitation. She had a job to do and she went straight to it. Through the wooden burrows and then up the burrowing bank she could be heard rustling along with her loads, and then in brief minutes out she came for more. From 3:30 p.m. until goodness knows what hour she worked a continuous "shuttle service." Food was disregarded entirely. We had provided a veritable floating raft of leaves.

I saw her a number of times during the evening, and when last inspected at half an hour past midnight she was still nest making! Leaf material was her object but wisps of grass in the water were also gathered. A second important habit revealed at this time, apart from the actual method of gathering and carrying material, was the fact that all of it was taken from the water. Wooden burrows through which Jill travelled contained leaves and grass but this was entirely by-passed. Even leaves dropped from her tail-bundles in the burrows were not picked up. All nesting material was chosen thoroughly wet in

the water. This fact has definite significance. Burrell (page 180) quotes Kershaw as saying that mere exposure of platypus eggs to dry air produces denting in a few minutes. Mr. Burrell also suggests that it is the necessity for a moist atmosphere over the incubation period that is part of the reason for the pugging of the burrow.

Jill has shown that the nest itself is made originally entirely of thoroughly wet stuff and it can be imagined that leaves and other material collected by wild female platypuses would be in an even more thoroughly soaked state than those we threw in for Jill on the afternoon of October 23. The thickness of the nest in a platypus nesting chamber, plus its damp nature, and the pugging habit, would undoubtedly provide for some little time the moist atmosphere mentioned by Mr. Burrell.

The afternoon and night of October 23 saw the beginning and the completion of Jill's nest-building — a typical example of the restless nervous energy of our duck-billed oddity. The following day, October 24, she emerged at 3 p.m., with no further leaf-gathering ambitions, and chewed away continuously far into the night. This and the following day were the last two days before retirement. It should be understood that a very special diet had been accorded her for some time, consisting of prodigious quantities of beetle larvae, tadpoles, young yabbies and earthworms of several species.

Again, on October 25, Jill appeared — on this occasion at 10:30 a.m., to feed ravenously and continuously. On both these days she appeared shy and disinclined for any form of frolicking about, which was so frequently her custom when I paid her a visit. At dark on the 25th, after an all day feeding session, she retired. That was her final disappearance for the incubation period and it seems reasonable to assume that the first at least of her eggs (one or more in number) was laid during that night — for her period of preparation and feeding had ended, and now she was really down to business. It should be recalled at this point that just a fortnight had elapsed since the only observed instance of mating had occurred.

At the time of her withdrawal from public affairs, Jill was both fat and well. The number of pugs placed in the burrow, thus blocking the



Jack feeds from the author's hand while swimming in his tank. The bill of the male platypus is very large and wide, and its proportions are shown clearly. Jack has never become as friendly as has the younger-caught female, Jill.

brooding animal in her nesting chamber, could not, of course, be ascertained; but that she was in the habit of carrying out these activities was revealed later when finely worked dry earth (that, as Mr. Burrell remarks, slips through the fingers like flour) came to light along the course of the opened burrow.

Day after day passed by and night succeeded night with no sign of Jill. No food was touched and the water of her long swimming pool remained as clear as crystal. Imagine our excitement! I could feel it in my bones that at long last, after all the years of endeavour, luck had turned and Jill was curled up below ground in the peculiar upright ball so typical of her kind, while reposing in her lap were the precious eggs (one, two or three) comparable in size to those of a sparrow.

The earliest sign of a reappearance by Jill was evidence that during the early morning hours of October 31 she had pushed away grass arranged in the nesting burrow "doorway." She had defecated in the water but no food had been touched,

nor was the water stirred up. The animal was not seen and evidently she had simply come in and out for the purpose of wetting her fur and defecation. This emergence was on the 6th night following five full days and nearly six nights of absence.

On the next occasion (November 1) Jill appeared at 2 p.m., when she stayed out for just half an hour. She appeared unusually timid. For the whole of this time she rolled and swam about in the water, making no definite attempt to feed but concentrating strongly on toilet scratching of her fur with her hind feet, combing her flanks and lower back. For the first occasion in the many times she had been watched at this process her combing extended into the abdominal region in what might be termed the pouch or mammary area. Perhaps this region was matted owing to the stickiness of the eggs when first laid; or again, perhaps the stimulus of developing milk glands caused Jill to scratch so continuously at this spot.

During the brief half hour of her outing she

kept her beak pointing anxiously towards her burrow entrance, and was never far from it. Her outing obviously had a threefold purpose:

(a) A wetting.

(b) Exercise.

(c) A cleansing of her fur.

Following her return she could plainly be heard scratching through and replacing pugs in her burrow. Her third outing took place during the early morning hours of November 3, some

am convinced that during the three weeks or more which elapse between the laying of the eggs and the onset of lactation, the female not only does not leave the nest, but also passes into a condition of partial aestivation."

In order to convey some idea of the period of incubation, which must necessarily be somewhat uncertain though definitely much shorter than was supposed, tabulated observations are set out below.

NO. AND DATE OF EMERGENCE.	TIME DURATION FROM DATE OF RETIREMENT 7 P.M. X/25/43.	TIME SPENT OUT AND NOTES ON BEHAVIOUR.
1. X /31/43.	Five complete days and nearly six nights.	Out during early morning hours for extremely brief wetting of fur and defecation. No food eaten. Animal not seen.
2. XI/ 1/43.	Six and half days and seven nights.	Observed 2-2:30 p.m. Fur preening and considerable scratching at mammary area. Raising her body side on to reach this abdominal region. Exercise and fur wetting, "pointing" anxiously with beak at burrow entrance.
3. XI/ 3/43.	Eight days and nine nights.	Not seen. Out between times of 1 a.m. and dawn. Evidently same as before, wetting, preening, and defecation. Extremely small evidence of feeding.
4. XI/ 6/43.	Eleven days and twelve nights.	Seen 11-11:45 a.m. Looked a bit miserable. Feeding; ate a few small yabbies and earthworms. Exercising a lot. Up on landing board, concentrating on turning side on and continuously scratching mammary area with hind feet.
5. XI/ 7/43.	Twelve days, and thirteen nights.	Seen 5 p.m.-5:45 p.m. Swimming actively, feeding and again scratching mammary area while on landing board. "Waving" her bill anxiously at entrance of burrow as seen on previous occasions. Once she made up her mind there was no hesitation about returning.
6. XI/ 9/43.	Fourteen days, and fifteen nights.	Seen 12:30 p.m.-1:30 p.m. Same behaviour.
7. XI/10/43.	Fifteen days, and sixteen nights.	Seen 3:30 p.m.-6:30 p.m. Very little fur preening. Feeding very vigorously.
8. XI/11/43.	Sixteen days, and seventeen nights.	Seen 3:30 p.m.-6:30 p.m. Feeding hungrily whole time. Looked well though usually thick tail had now become strap-like.
9. XI/12/43.	Seventeen (really eighteen) days, and eighteen nights.	Seen 7 p.m.-10 p.m. Very hungry and lively. Feeding vigorously.
10. XI/13/43.	Actually nineteen days, and nineteen nights.	Seen 4 p.m.-8 p.m., behaviour similar to last.
11. XI/14/43.	Nearly twenty days, and twenty nights.	Seen 3 p.m.-6:30 p.m. Feeding vigorously. Much food consumed now.

time between 1 a.m. and dawn. There was little, if any, evidence of feeding — and again the excursion was almost certainly a matter of defecation, fur wetting and brief exercise.

On account of the considerable loss of condition noticed in the animal over this period, as distinct from her appearance following winter absences, added to the forerunning preparatory period when she built up her reserves, I think it most unlikely that she passed into any state of torpidity or low body temperature peculiar to periods of hibernation. On the other hand Mr. Burrell ("The Platypus," page 182) writes: "I

In arriving at a fairly reliable, though naturally somewhat approximate, estimate of the incubation period which is my main purpose in listing the above table, it is as well to bear in mind Mr. Burrell's chapter on "Nursing Habits of the Platypus." Quoting from page 184, he says: "The most remarkable and mysterious feature about the baby platypus is that it is not suckled at all by the mother for some days after hatching for the very good reason that the maternal mammary glands are not yet actively functional. Investigations of this extraordinary phenomenon have advanced far enough to place the



Jill is particularly clever at pulling herself out of the water and extracting earthworms from between the author's fingers.

matter beyond doubt, etc. . . . The delayed lactation which I have observed may be due to the incomplete development of the necessary stimulus in the early young. How the young platypus is nourished in the meantime, I do not know."

From the notes in the table it will be observed that Jill concentrated on each of her early outings on an oft-repeated and entirely new habit of scratching vigorously at the area of the mammary glands. It was no mere preening, and probably may have been brought on by stimulus from within requiring a type of external massage. In other words, it is possible that the mother animal may stimulate herself in order to

bring about the supply needed by the very tiny, helpless babes. Bearing this in mind and the fact that the mammary glands are not functional for several days after hatching, and the important observation by Caldwell that the egg of the *Ornithorhynchus* when ready to be laid contains an embryo already in approximately the same stage of development as a thirty-six-hour chick, it seems that Jill's activities indicate a very short incubation period.

The mere fact of a three-quarter-hour absence from the nest on November 6 (her fourth outing), her feeding on that date, and practically daily appearances for increasingly long periods

thereafter, are strong evidence that hatching had occurred at least several days previously. In view of the evidence set out it is not unreasonable to suggest that the longest possible period for egg hatching was ten days and the shortest perhaps slightly less than a week. It is of course quite possible that her first and even second excursions, brief as they were, took place before the hatching point had arrived, and had as their aim the bringing in of additional moisture.

Definite evidence of demands upon the mother's resources appeared from November 6 onwards when her mammary glands were evidently functioning. She began to feed vigorously and to appear regularly for longer periods. An interesting observation was the fact that the times between her outings became progressively shorter. No further scratching of the mammary area was noted after November 7, when the busy little animal spent her whole water periods in continuous feeding.

Carrying on with the tabulated and systematic summary of Jill's activities from the last listed date, the 14th of November we have the following:

DATE.	TIME SPENT IN WATER.	BEHAVIOUR.
XI/15/43.	11:30 a.m.—3:15 p.m.	Fed vigorously.
XI/16/43.	12:30 p.m.—4:30 p.m.	Feeding very keenly on yabbies, worms, grubs.
XI/17/43.	11:30 a.m.—4 p.m.	Same as above.
XI/18/43.	10:30 a.m.—4:30 p.m.	Jill now left baby or babies in nest for six-hour stretches and was with them for approximately 18 hours.
XI/19/43.	8:30 a.m.—2:30 p.m.	
XI/20/43.	Out early morning hours—11:30 a.m.	Hours in nursery steadily decreasing.
XI/21/43.	Jill out* during the night. Out again 5 p.m. onwards.	First time out twice in 24 hours.
XI/22/43.	Out 2 p.m. until dark.	Her appetite greater than ever.
XI/23/43.	Out early morning and all day until dark.	
XI/24/43.	11 a.m. until evening.	
XI/25/43.	12 noon, still out at 10 p.m.	Had been out ten hours continuously feeding and still going strong when last seen.
XI/26/43.	1 p.m. until far into night.	Condition of Jill herself vastly improved. No longer at all worried about nesting burrow. Resuming her old playful ways and leisurely combing herself on landing board at night.
XI/27/43.	Out 3 p.m.—most of night.	Exhibited to public.
XI/28/43.	Out 4 p.m.—onwards through night.	Exhibited to public.
XI/29/43.	Out 2:30 p.m. onwards through night.	Exhibited to public.
XI/30/43.	3:45 p.m. onwards through greater part of night.	Exhibited to public.

Jill had now reached her peak as far as maximum foraging periods were concerned — spending as long as fourteen consecutive hours in the water feeding, with very occasional visits to land-

ing platforms for a little fur preening — while her baby (a single one, as we discovered later) was safely tucked away in its nesting chamber behind safety pugs in the passage way. However, in this process largely performed by the mother's tail, no further abrading of the stiff hair on its extremity — apart from that lost in the winter period — occurred.

With the coming of December Jill's excursions took more of a nocturnal turn. She appeared round about 7 p.m., and stayed all night. There was also evidence on December 2, that she had pulled grass from her wooden burrows into the water and then transferred it as fresh nesting material up the burrow to the nesting chamber. Wisps of wet grass were strewn over the water surface in all directions, and also about the entrance to her burrow. According to calculations about the incubation period, the single youngster (there is yet to be a thorough search of nest débris for egg shells) was now (Dec. 2, 1943) aged four weeks. Jill was very consistent in her outings, appearing each evening between 7 and 8 p.m. (E.D.S.T.) and leaving the youngster to its own devices in the nest all night. She

was quite back to her normal outlook on life — gay and carefree in behaviour. Naturally, however, any shortage of food supply on a particular evening would cause her to emerge hours earlier

on the succeeding day to make up the leeway.

On the night of December 7 I caught her for an inspection, noting that her condition was comparatively fat while the abdominal mammary area showed the typical slight indentation with a median growth of rusty-red fur differentiating from the rest of the ventral surface. Domesticated and trusting as Jill is, she objected most strenuously to such indignities as this, so, although I made an attempt to express milk by squeezing the mammary area, I had to desist almost at once.

On December 13 a test feed was given to ascertain the quantity and weight of the assortment of items the little animal was now in the habit of devouring during her nightly banquets. The list included the wireworm larvae of click beetles, chafergrubs, stag beetle larvae, earthworms and land yabbies (burrowing cray fish). The youngster at this date was nearly five and a half weeks old.

It was found that Jill in this one night consumed a typical meal of the following items:

WORMS (native species, larger than European earthworm): 400.

GRUBS (mainly chafers): 338.

YABBIES: 38.

The total weight of all these items without soil of any kind was $28\frac{1}{2}$ oz., or $1\frac{3}{4}$ lbs.! Considering Jill's mere $16\frac{1}{4}$ inches length and her body weight of an exact 2 lbs., when in her fattest condition, this test gives some idea of the amazing appetite of *Ornithorhynchus* — particularly during some phases of the nursing period. What a terrific time of it mother platypuses must have in their wild state! Little wonder (see later) that some baby animals leave the nesting burrow too soon. Naturally an animal weighing two pounds could not hold a meal of another $1\frac{3}{4}$ lbs., and it follows that the nursing platypus mother must assimilate the food as she swims and build up her milk supply to full capacity over the extremely long hours (up to 14) of continual foraging.

Energetic Jill actually found time away from her hours of busy mastication to drive into her nesting chamber from an old side burrow which she cleaned out. This was now used as an entrance passage while the original doorway up on the north side of the Platypussary was aban-

doned. From December 19 onwards with the youngster then approximately $6\frac{1}{2}$ weeks old, there was a noticeable falling off of Jill's appetite. She ate few earthworms, and concentrated mainly on grubs and yabbies. This, together with the abandonment of her former mode of entrance to the nesting burrow, plus the fact that now for the first time since the pre-nesting period she had commenced working soil out of the old living burrows on the South side of the Platypussary, seemed to me, at the time, a very ominous state of affairs.

To make my worries worse a family of Swainson's Phascogales (large pouched mice) of insectivorous and occasionally carnivorous tastes, had taken to living in and about the Platypussary, and naturally I imagined that perhaps they had even tasted tender young platypus! Beyond a good appetite Jill gave few signs that she had any family responsibilities. She was to all intents and purposes an ordinary platypus citizen. As we discovered later, her labours on the Southern side of the Platypussary, when soil would occasionally be pushed back for 18 x 6 x 6 inches into wooden "burrows" connecting with the water, were devoted solely to the purpose of making pugs for yet a third route of daily egress from, and entrance to, the nesting chamber.

I could sometimes watch her at work blocking up the passages — a small creature of marvellous strength and industry. In view of later knowledge, the comparative falling off of Jill's appetite was probably connected with the stage of growth attained by the youngster. Mr. Burrell (page 189) remarks: "A rapid rate of growth in the early stages but such rapidity is explained by the fact that when once the young commence to suck, their appetites increase rapidly. The quantities of food found in their stomachs on dissection are surprising."

It is indeed very probable that once having attained a certain size, with fur beginning to make an appearance, the youngster enters a quiescent phase, requiring less nourishment than previously. In any event, it was true that leading up to the stage of five to six weeks, Jill's baby required a phenomenal amount of nourishment. However, in our general ignorance at the time of Jill's late December activities, or shall I say, lack of extra activities, time dragged and I



Samples of the food of the platypus—land yabbies (burrowing crayfish) and earthworms. During December of last year it was a common thing for Jill to devour one and three-quarters pounds of such food each night, although her own body weight was only two pounds. She fed voraciously to keep up her milk supply for the young platypus.

became an impatient and badly disappointed observer.

The days went by until the calendar registered January 3, which would make the inmate or inmates of the nursery at least $8\frac{1}{2}$ weeks to 9 weeks of age. It seemed that Jill must have failed, particularly in view of Mr. Burrell's statement (page 188): "About six weeks after hatching the young will have reached a length of twelve inches . . . by this time their eyes are open, their fur is quarter of an inch in length, and they are able to crawl freely about the burrow."

In any case it now seemed that in the interests of finding some record of Jill's underground activities, the nesting burrow should be opened. With great care, then, we began this delicate operation on January 3, carefully removing the firm ground from the extreme back of the Platypussary so as to avoid as far as possible interference with any tunnels leading to the nesting chamber. High up near the passageway used during and after the incubation period, we found a deserted composite nest of grass and leaves. Possibly this was a nest from the previous year and we had not seen her carrying in the material.

In any case it did not improve our prospects. We dug on — not so carefully now, and found we were following a burrow that ran well below the surface on the Southern side of the burrowing bank. On its floor was a good deal of well-worked, bone-dry floury earth that tells of frequent working and pugging. Suddenly, in the bend of the burrow, dry leaves showed up, there was a shrill sustained growl of annoyance (like that of a broody hen) and Jill's beak and head poked out. To our delight (and horror also!) there bulged out, and was pushed out as Jill in her rage turned her back and began to throw out nesting material and earth to block out the daylight, a blind, fat, wrinkled babe with satiny, short fur, forming a very thin coat.

The baby creature had a tiny, stubby "milk bill" aptly likened by my assistant, Mr. Milne, to the beak of a Cape Barren goose. Here at last was actual proof that we had really bred the platypus. It seemed also that we had wrecked all our chances of complete success by unwittingly breaking in too soon. At eight and a half weeks this youngster was only nine inches long and entirely helpless — its only utterance a kiss-like sucking sound, and its only movement that instinctive lifting of a hind foot to go through the characteristic motions of scratching the fur on its flanks. On the ankles of its hind feet tiny spurs were visible.

A frantic few moments followed with the camera recording half a dozen hasty pictures. What would Jill do? She had already thrown out part of her nest and blocked the way by which we had disturbed her. We thought at the time that in with her was another infant, or perhaps two, but later observations proved the baby we photographed to be the only one. I scraped away her hastily-constructed "pug," and endeavoured to replace the baby. However, she persisted in her "back-shoving" and buried the baby with earth. I repeated the performance, got the baby fairly well in, and then built a "pug" of my own, so as to block it in. Then we fitted a hollow log over the spot and filled up with an overburden of earth and old bags.

As one can imagine, our feelings were very dubious. What good all the notes so far if Jill did not rear this little fellow? I called back that night after dark to see if Jill had pushed the

baby out into the loose soil in the hollow log, and it was of some slight reassurance to find that she had not done so. Evidently she was in a considerable turmoil of mind over the event, for an hour after we had replaced the youngster in the burrow at midday, Jill appeared in the water in obvious agitation.

And hers was not the only disturbance of mind! We had staked everything on a successful issue with the platypus — even to almost ruinous expenditure from slender Sanctuary financial resources — in purchasing food that cost at least £1 a day, and in dry summer months 22/- to 25/-. It seemed that it was this season or never, and in spite of all, this season it was!

Following several weeks of doubt and worry, subsequent to January 3, it was found that Jill had re-established her quarters and maintained her youngster in spite of the general upheaval. Considering that this small mother animal is a member of such an exceptionally nervous species with probably no temperamental equal among the world's furred animals, no tribute to her mothercraft can be too high in view of her actions following the breaking-up of her home. Here, in the survival of her helpless youngster, is noteworthy evidence of a strong maternal instinct in the platypus — one reason, perhaps, why this ancient species has managed to survive and even thrive in modern days. Why, even a tame doe rabbit would probably have deserted her brood had her nest been interfered with as had Jill's!

For several days after the disturbance I could hear her towards evening through the walls of the dwelling, excavating passages and also pugging up the outlet near her entrance to the water, as she prepared for the night's feeding activities. Actually it was not for two days after the January 3 inspection that Jill got back into her normal habits of feeding. The night following the excavation of her nesting tunnel, she spent within the burrows, evidently keeping the youngster warm, for later inspections revealed that in thoroughly pugging up the original entrance that I had ruined, she pushed out her whole nest and much soil beside. Then she dug a new entrance and exit burrow to the nesting chamber on the side opposite to the original one which we had unwittingly destroyed. For weeks,



Mr. Fleay extracts "Corry," the baby platypus, from the nesting chamber. This shows a section of the interior of the burrowing bank at the rear of the Platypussary. Some of the leaves carried into the nesting chamber by Jill, as a bed for her baby, may be seen at the left of the little animal. Jill always protested a removal.

then, the youngster was entirely without bedding of any kind until, on the next inspection, I provided a new collection of leaves which Jill accepted quite gratefully.

On January 3 it was found that the youngster, whose sex at that time could not be determined, but which we now know by the disappearance of its spurs to be a female, had attained a length of nine inches and was blind and entirely helpless, with a very short growth of satiny fur at the age of eight and a half weeks.

Such observations and others to follow do not agree entirely with Mr. Burrell's notes on incubation and adolescence, but, as I mentioned previously, this is not surprising, for throughout his long and careful work resulting in the classic book on the platypus, Mr. Burrell did not have the good fortune to keep a breeding platypus where he could watch it. He had to make his

estimates from laborious field study over long years, for which valuable work naturalists the world over, and I particularly, are grateful to him.

From mid-January onward, Jill's furry coat took on a very sorry appearance. This was partly due to the arrival of the moulting period. Each year in Southern Victoria, towards the end of January and the beginning of February, platypuses lose their old coats and rapidly grow new ones. Worn patches on tails are covered by a fresh growth of hair in a very short period, and it is no time before a platypus is clad in a new and glossy coat of superb fur.

Jill, with her domestic cares, was terribly "moth-eaten" and ragged, but extremely cheerful, with a streaky worn patch from shoulder to hip along the left side of her body. This was evidently due to some position adopted in the

burrow, or to some activity on the part of the baby. About the middle of February her new coat began to cover these marks of wear and tear.

Evening after evening when I arrived at the swimming tank before her advent in the water, her progress along burrows could be marked by careful listening. The digging and scrambling noises as Jill dug through the earth blocks in the burrows and pushed them back again after her were unmistakable. The fairly frequent dog-like shakings of her body to rid herself of loose earth during these operations sounded at close quarters like distant thunder.

The second inspection of the youngster (when all doubts as to its safety were dispelled) took place on the evening of January 26. It was obvious that by now the youngster should have made considerable progress, and since mid-January the mother's appetite had increased until she was demanding almost as much as she did in late December, 1943. On the evening of the second parade of the youngster, Jill had already journeyed into the water where she was "splash-diving" in mock alarm and rolling and twisting between submerging for food items.

Now aged eleven and three-quarter weeks, the youngster measured eleven inches in length, its fur had grown longer on the body regions but not on the tail. Little development of the short, stubby beak had occurred. Its eyes had not been long open, probably not more than four or five days, so that it could be reasonably assumed that the young creatures spend at least eleven weeks in a state of blindness. The striking thing in the absence of the mother on this occasion was the almost reptilian coldness of the baby.

Generally speaking, the little fellow was much less fat than when first seen — its tail now being more flat and platypus-like than the roly-poly sausage-like appendage noted on January 3. Also, though no longer blind, the young animal possessed no power of locomotion, and again went through the curious instinctive action of scratching at its flanks with its hind feet. When my wife held it, it pushed its short stubby beak down on the skin of her arm. Its only reaction to the disturbance was to growl shrilly when first touched in the burrow. In the absence of a nest — a situation that was soon remedied — dry earth from the floor of the chamber had caked into

hard mud over the doubtless oft-wetted bill and nostrils of the baby. This was removed.

Jill's feeding periods were regularly from ten to twelve hours in extent, commencing toward evening and extending through the night. The evidence of various fecal deposits in the water (the pools being cleaned daily) indicated that as usual she masticated and assimilated food continuously throughout the nights in order to build up the all-important milk supply.

The third inspection of the baby was made easy by the fact that I had a bag "plug" in the back of the nesting chamber — this in turn being buried under a weight of soil, for it is very obvious that in some mysterious way a platypus senses the thickness of soil between itself and the surface. Jill evidently became more or less reconciled to these visits, for beyond a little shrill growling she was not unduly upset. The date of the third visit was February 8, with the baby now thirteen inches long, eyes quite bright and alert, and its age thirteen and three-quarter weeks, or slightly more than three months.

The youngster was three inches longer than had been Jill herself when picked up, six years ago, on February 19, 1938. On scraping away the soil immediately adjoining the leaves of the nesting chamber "bedding," when opening up for each of these inspections, it was extraordinary to feel the intense warmth that had emanated from the closely curled mother and baby. This in itself, even before sighting the animals, proved a certain indication that they were at home.

The baby was now a young platypus with a fairly straight though short bill, long and very handsome fur, and it was certainly a female, for the small spurs on the ankles of its hind feet had shrunk away to mere hard stubs. Remarkable to relate, the animal still did not show any sign of activity, remaining curled up in the typical platypus ball in the nest. When taken out, it seemed capable of only very slow movements — again tending to use its hind feet in the pathetic, useless and almost reflex scratching motion.

There was little doubt that it had not yet left the nest even to crawl about the burrows. On this occasion, while we had the baby out to secure a few photographs, the bag plug was not replaced in the hole. When we returned with the baby Jill had already sealed it up with soil

from within. She could not comprehend that the youngster was still outside!

Friday, February 18, was the date of a fourth visit to the baby *Ornithorhynchus*. Jill was now showing definite evidence of her new coat. The bare patch on her tail had grown over, and her general appearance was much more neat and tidy. The youngster now measured $13\frac{1}{2}$ inches at fifteen weeks of age. Its fur was long and glossy, beak better developed, and now its powers of movement were much more pronounced. Jill seemed fonder than ever of her almost adolescent child, and refused to move out of the nesting chamber at all. Her mammary glands were obviously still functioning quite well, for she still stayed out all night consuming quantities of food as huge as the tested meal of December 13. Once again the baby's nostrils and upper beak were caked with hard mud. Attempts to express milk from Jill's mammary area were unavailing as, quite rightly, she objected most strenuously, and it would have done harm to have held her by force.

The fifth appearance of the young *Ornithorhynchus* was a notable one and took place on February 22, when it was aged just over sixteen weeks. On this celebrated occasion Herald Cinesound News Reel photographers came by arrangement and filmed the baby (not in the water of course) and both its parents. Jill rose to the occasion in a most spectacular fashion. The little fellow was noticeably active on this day, and when placed temporarily in a large tin filled with dry grass, it tried repeatedly to crawl out over the top. When replaced in the nest it crawled out of sight into the burrow, but a further peep that night revealed that the comfort-loving little creature had returned to curl up on its bed of dry leaves while poor Jill was out as usual hunting for its nourishment in the water.

On this occasion (February 22), when feeling for the baby in the nesting chamber, the youngster had grown to such a bulk that I almost confused it with its mother. Jill, by the way, put on in this instance a remarkable display of mock ferocity. Each time my questing fingers entered the burrow, she seized them in her rubbery beak and endeavoured to remove them from the nesting chamber. In fact, she literally "ran" me out of the burrow to the accompaniment of shrill

growling.

There was now little doubt that the youngster could, if it wished, enter the water and eat adult food. Its weight was just half an ounce off one pound, and its length thirteen and a half inches. For the past fortnight Jill had made no attempts to pug or block off the burrows. There is apparently a definite relationship between the amount of food that it is possible for the mother animal to procure, and the particular time at which the youngsters depart to make their own way in the world.

Over the past six years I have noticed that a number of very undersized and miserable baby platypuses (Jill among them) have been discovered in all sorts of odd places in the Healesville district between the times of late January and mid-February. Some have been in a dying condition when caught. Two that we found in Lake Yumbunga, Chum Creek, Healesville, were so weak that they were picked out of the water by hand.

Evidently, then, unless something happens to the mother, or for reasons of a diminishing food supply, when the youngsters are forced to move out prematurely, they stay in the nursery for a long period (in this case 17 weeks) and when finally taking to the water at 13 to 14 inches in length, they are thoroughly well grown and able to care for themselves. In the case of Jill's baby, the mother herself lacked for very little in the way of food, and she had no distance to go and gather it, so that the youngster, itself the sole member of a family which in the wild state usually numbers two, enjoyed conditions of the very best. It left the tunnels for its first observed outing in the water at 5:15 p.m. (E.D.S.T.) on February 26, unattended by the mother, and immediately commenced feeding sparingly upon small yabbies, beetle larvae and other items of adult food. Its length was still $13\frac{1}{2}$ inches, and its age corresponding to the length of time it had spent in the nest was seventeen weeks. Its weight at this time was 1 lb.

In fact, the date of its debut was just a day over four complete months since the famous October 25 when Jill retired to lay and commence her period of incubation. There is little doubt that for about sixteen weeks the young animal remained immobile in the nesting cham-



A closeup of "Corry," taken on the same day as the picture that is the frontispiece of this article. The beautiful glossy fur of the sixteen-weeks-old platypus is noticeable, as are the ear and eye openings.

ber, feeding from its mother during her presence at home, but otherwise curling up and spending its entire time asleep in the nesting chamber.

The excursions of the little fellow into the water, beginning in the late afternoon of February 26, by no means ushered in a new phase of independence, though doubtless many young platypuses, particularly those found wandering some distance from water, lose contact with their mothers at this stage, especially when the nesting burrow entrance is many feet from the water's

edge up a steeply sloping bank. I recall that all the well grown young platypuses I have captured in Healesville streams during the month of March have been on the thin side, with strap-like-tails, which seems to indicate that the good condition of nest-leaving young is a prerequisite towards the difficult early stages of enforced independence.

The little lady's activities over succeeding days, to the date of having these notes typed, may be summarized as follows:

DATE.	TIME SPENT IN WATER.	ACTIVITIES OF YOUNG ANIMAL AND MOTHER.
1944 Feb. 26.	First outing 5:15 p.m. In before 8:45 p.m.	On each date the mother animal appeared in the vicinity at 7 p.m., eating all night through as she had done previously. During daylight she and baby were curled up together as usual in the nesting chamber. As usual Jill seized my fingers when I opened the bag plug in nest and endeavoured to "run" me out. This maternal solicitude, her continued enormous appetite, and the fact that the youngster ate only a small amount during its two or three hours abroad at night, indicated that she was still nourishing it on milk. The weaning period had evidently begun.
Feb. 27.	Out 7:15 p.m. In before 10 p.m.	
Feb. 28.	Out 7:15 p.m. In before 9 p.m.	
Feb. 29.	Out approx. 7:30 p.m. In 10:15 p.m.	
March 1.	Brought out for first public swim, 3:30 p.m. Not seen in evening.	

In the water at night Jill played with her daughter, swimming about it and nuzzling it with her bill, and once or twice she playfully pulled it off landing stages. There was no evidence that she masticated food for it, or foraged for it in any way. Both animals frequently splash-dived, Jill in mock alarm, but the youngster quite frightened on occasions. It was very clear that the fat, healthy little creature became both fatigued and very cold after a three-hour swim in the evenings of these early days.

Sure signs were a humping of her back, repeated attempts to scratch her flanks and back with the claws of her back feet. These symptoms foretold an early departure into the burrow. Jill was rather an unsympathetic mother on various occasions, and levered her tired offspring back into the water once or twice before it was able to retire, and then pushed her head after it into the tunnel as much as to say "What! So soon?" It will be interesting to find out how

long her maternal solicitude continues. Apropos of this, it happened that on March 6, 1937, I dug out a platypus burrow in the banks of the Barwon River, South of Winchelsea, Victoria, and found there in a nest at a burrow terminus, a fine female animal with a young male duckbill practically the same size as herself. What he was doing in the nursery at that advanced stage has often puzzled me. It seemed probable that he was still tied to his mother's apron strings.

Finally it remains to give Jill's baby a name. Now that the youngster has ventured into the world, she becomes a personality. Probably by the time these observations are published the christening ceremony will be a thing of the past. The youngster is to be called "Corry," an abbreviation of "Coranderrk," — aboriginal term for "the creek of the Christmas Bush" (*Prostanthera*), which is actually the name of both the Sanctuary and adjoining forest lands through which runs Sylvan Badger Creek.

The Fox Maintains His Reputation

THREE WORKERS out on the tundra noticed a fox seated on its haunches some distance away. The men stopped work and coaxed the animal closer by tossing bits of ration biscuit. Shortly it was eating from the tips of the fingers on an outstretched hand. Now, the man who was doing the coaxing had ideas of capturing the fox for his pet and more than once made a grab for the animal with a heavily-gloved hand. But as quickly as he moved, just as quickly moved the fox, so it developed into a sort of game, the fox coming back each time. Then the men decided to make a snare of their combined bootlaces. They put the loop on the snow, put some biscuit in its center, and stood back holding the slip line. Up came the fox, but at the moment he started to cross the snare, he stopped and sat down just clear of it. After a minute, he raised up a paw and brought it down in a side swing that dragged the snare away from the bait. Without more ado, he grabbed the bait and jumped back.—*Ralph James Donahue*, CM 2/C (D-4), in a letter to Dr. William Beebe from Somewhere in the Aleutians.



An animal artist himself, Mr. Wilwerding takes a look at the drawings and paintings that have interpreted animal life to us in the past.

A Short Account of Zoological Illustration

By WALTER J. WILWERDING

THE ART OF DRAWING and painting pictures of animals is not new. Cavemen drew recognizable pictures of animals, and the ancient Egyptians painted birds and animals that are found in Africa today and may be readily identified in these early paintings. But it was not until after printing was invented that any serious attempt was made to describe animals and their habits, and illustrate these descriptions with pictures. As might be imagined, the first books on natural history were lacking both in authentic information and pictures that resembled the animals. There were unicorns with horns growing out of foreheads and, even when the artists learned that a rhinoceros did not look like a horse, that animal was shown with armor-plated sides studded with rivets.

Most of the earlier pictures of wild animals, from Africa, Asia and other parts remote from Europe, were drawn from imagination and inadequate descriptions of the beasts, brought home by travelers who had seen them in their native haunts.

Gradually, as strange animals were brought to Europe, artists began drawing and painting accurate pictures made from life. Rembrandt drew some very good pictures of camels and other animals that he saw in zoological collections. There were of course a number of good artists who painted domestic animals in the sixteenth, seventeenth and eighteenth centuries,

but it was not until the nineteenth century that artists really seemed to take an interest in painting authentic pictures of wild animals. That century produced some of the outstanding animal artists of the world. Zoological collections had grown, living models were available and animal art flourished.

The naturalist-artist John James Audubon (1780-1851) was a pioneer in painting his subjects in the wilderness where he found them. Audubon was a hunter and pursued his work under conditions that would have tried the patience of any but one who possessed his zeal and courage. He truthfully painted the birds and animals that fell to his gun, working more in the tight, detailed manner of the scientific illustrator than for pictorial effect. His work was published in England in what is known as "the elephant folio," showing American birds in life or almost life size. This folio is now rare and very expensive.

In 1900, Audubon's animal illustrations were used in John Burroughs' book "Squirrels and other Fur-Bearers." Recently, the bird pictures from the elephant folio have been published in book form by the Macmillan Co., which was followed by another book showing his paintings of animals. Thus his work has been perpetuated and made available to all.

Interest in animals appears to have been at a high pitch during the nineteenth century, since



"Siberian Tigers," by Wilhelm Kuhnert, from **"Tierleben der Erde."**



"Fighting Rhinoceroses," by Meyerheim, from **"Animal and Bird in Picture and Word."**

so many great works on natural history appeared at that time. Much of this may have been due to settlement in South Africa, which opened up that tremendous reserve of animal life and brought many new species to the attention of the world, for there are more different kinds of the larger four-footed animals in Africa than on any other continent on this globe.

It was then that Carl Vogt, professor of natural history at the University of Geneva, wrote his great work, "The Animal Kingdom," which was translated into English and published in this country by D. Appleton in 1888. The pictures were from woodcuts by the distinguished animal artist Friedrich Specht of Stuttgart. Specht did not guess at animal forms. He drew his animals from life. One look at the settings and one knows that he also drew these from nature. His backgrounds for the African animals are authentic. It is plain that he saw the country that he drew. He was tremendously versatile and produced beautiful drawings of both small

and large animals in great numbers, all well posed and in proper setting of jungle, plain or forest.

When Brehm's "Tierleben" appeared in 1893, the work of Specht was again in evidence. So, too, in "The Royal Natural History" by Richard Lydekker, we see the woodcuts of Specht. But here there are also drawings by G. Mützel and some lithographs in color by G. Smit.

Various large volumes on natural history were published in the late 'eighties and early 'nineties and, again and again, one sees the same illustrations by these same artists. One wonders whether the publishers bought the cuts from other publishers or just used pictures that were unprotected by copyright.

In 1897, McLoughlin Bros. of New York brought out a popular natural history for young people, "Animal and Bird in Picture and Word." They used pictures that had appeared in many of the great works of natural history. Specht appears again in large full-page illustrations.



"European Wild Boar with Young," by Beckmann, from **"Animal and Bird in Picture and Word."**



"Quagga, Bushbuck and Brindled Gnu," by Leutemann, from **"Animal and Bird in Picture and Word."**



There are pictures by Kuhnert, G. Mützel, Ludwig Beckmann, P. Meyerheim, Richard Friese and H. Leutemann. All the great names in animal art of that time are signed to the illustrations.

It is interesting to note that G. Mützel always signed his pictures "Nach den leben," from life, while H. Leutemann signed his "Nach der Natur," from nature. That both worked from live models is evident. Leutemann rarely made an attempt to show them in any other setting excepting that of the zoo. Even Meyerheim

showed his fighting Indian rhinoceroses in a zoo setting.

Meyerheim, who taught Kuhnert, and who was also the early teacher of our own celebrated animal artist Carl Runge, drew his animals in the zoo and made up his backgrounds in the studio. Kuhnert tells how he was everlastingly talking to Meyerheim about going to Africa to paint until, finally, Meyerheim said, "Why are you always talking about going to Africa? Do as I do: take a board, scatter some sand on it, a few stones and sticks and the wilderness is complete." That was Meyerheim's model for a wild animal background, but he did pretty well with his animals.

Typical of Friedrich Specht's work is this wood engraving from a book of natural history published in 1883. Specht usually managed to get action.

Kuhnert did go to Africa. A board covered with sand and stones held no interest for him. He was a hunter and shot the animals he wanted for models. He painted the African landscape from nature. His pictures abounded with the real atmosphere of that country. Later he went to Ceylon to obtain specimens of Asiatic animals and accurate studies of their habitat.

The result of Kuhnert's work came out many years ago in that beautiful work of natural history by Haacke and Kuhnert, "Tierleben der Erde," animals of the world. Hundreds of animals were shown in the full beautiful colors employed by Kuhnert. It was unfortunate that the same work, which was contained in a number of volumes, was not translated into English.



A wood engraving of "Bonnet Monkeys" by G. Mutzel, from "Animal and Bird in Picture and Word."

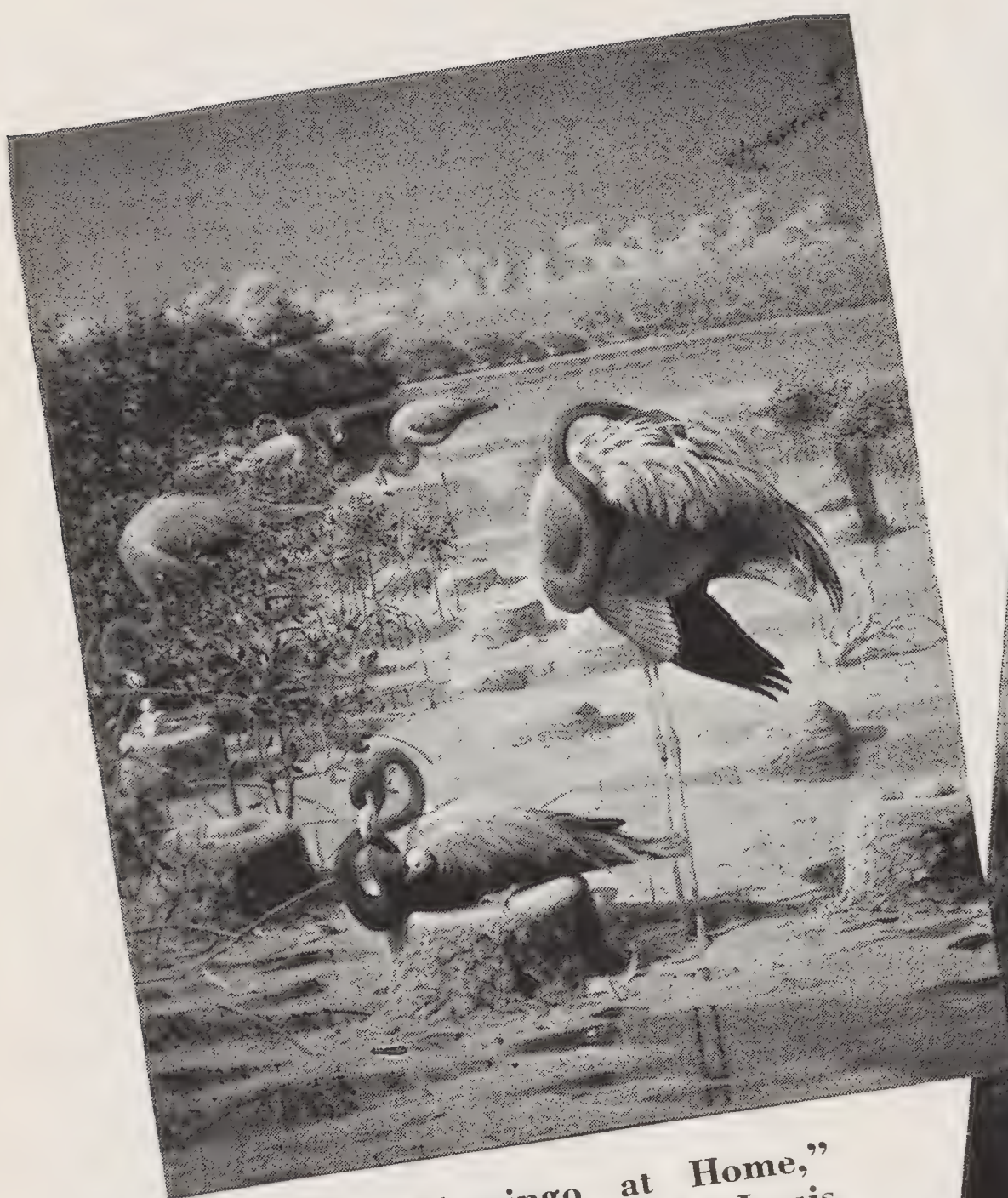
In 1890 Sir Samuel Baker's book "Wild Beasts and Their Ways" was published in London. He had a wide experience in hunting animals in Africa, America and Asia and the book is filled with accurate information obtained first-hand in the hunting field. The very good pictures were done by H. Dixon, and reproduced by the woodcut process.

Everyone is no doubt familiar with "Wood's Natural History." Just what this natural history was like in its original printing is difficult to say, but there were many reprints, mostly put out in cheap editions and apparently for young people. My own copy carries an 1898 copyright and was published by Conkey of Chicago. The pictures are in line and apparently chalk plates. Most of these are not bad in drawing, but are not signed. The book is without system and one turns the page describing a lion or other such animal and finds a snake or bird on the next page. Much of the text appears to begin in the middle of things, as if the information were plucked from longer descriptive matter. There were also smaller editions of "Wood's Natural History" and in some of these the work of Specht and other artists was used.

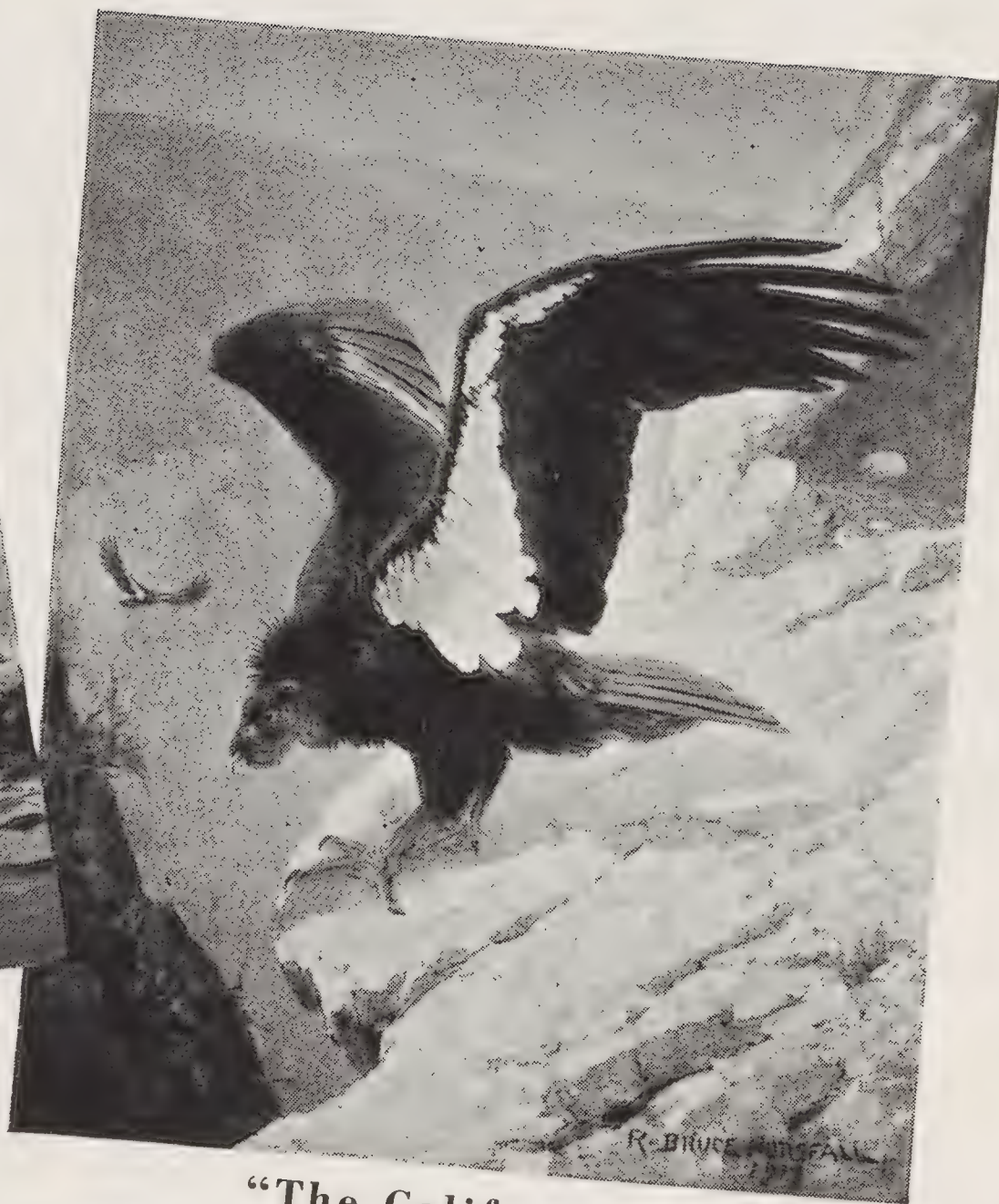
Many of the colored illustrations that appeared in early works of natural history were reproduced by the old stone lithography method, and this method produced beautiful results when handled properly. We recall a small album of animals that was printed by the Knapp Litho. Co. of New York, in 1900. It was called "Arbuckle's Album of Illustrated Natural History," which should bring a touch of nostalgia to older readers, for one obtained it by sending a certain number



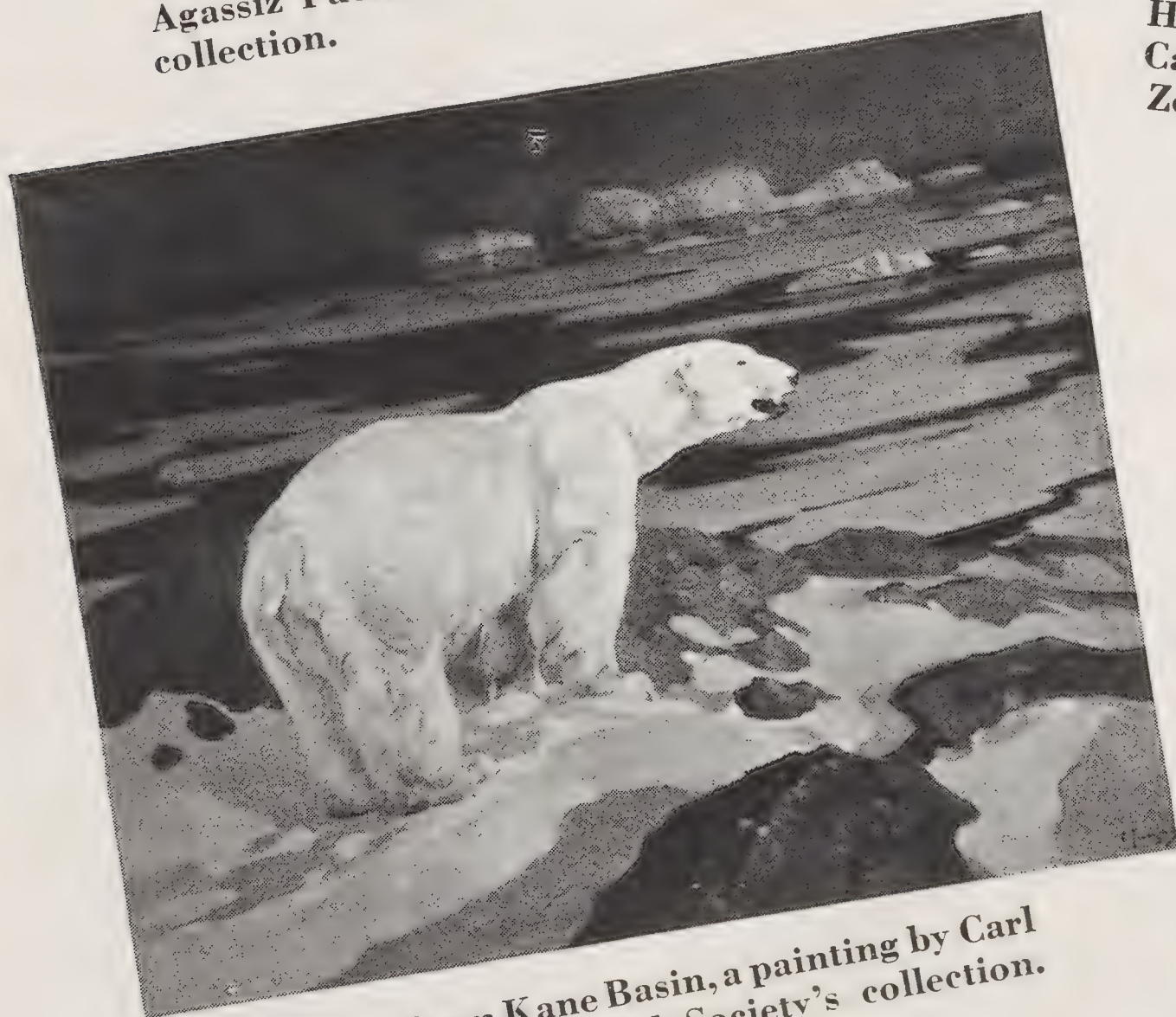
Gronvold's illustration of "The Blue Wren" in Aviculture Magazine of 40 years ago is typical of his style as a technical illustrator.



"American Flamingo at Home,"
Andros Island, Bahamas, by Louis
Agassiz Fuertes. Zoological Society
collection.



**"The California Condor at
Home,"** Sierra Nevada Mountains,
California, by R. Bruce Horsfall.
Zoological Society collection.



"Polar Bear" from Kane Basin, a painting by Carl
Rungius in the Zoological Society's collection.



"Lioness and Cub," by Charles
R. Knight.

of wrappers from Arbuckle's coffee. There is no mention of the writer who furnished the natural history information that accompanied the pictures, nor are the pictures signed, but it is plain that the source for the pictures was Specht. No doubt the artists with the Knapp Litho. Co. copied the pictures from Specht's woodcuts and painted them in color. In most cases the colors are quite correct, but there is a dark brown snow leopard and a few other animals that are far from right in color. With the few exceptions among the fifty animals shown, this is a beautiful job of stone lithography. The colors in my own copy, obtained by the coffee wrapper process, are as good today as they were in 1900 when I first opened the album to gaze at the pictures with wondering eyes.

The use of halftone was coming more and more into usage in those days and woodcuts were going out. Something, too, happened to natural history writing. Ernest Seton Thompson, whose later work was signed Ernest Thompson Seton, brought out a number of books about animals in story form, illustrated with his own drawings done in pen and wash. Will Long also wrote a number of books describing his own experiences in the woods with animals, which were published by Harper and were beautifully illustrated by Copeland. Others followed the example set by these writers, and similar books, carrying animals through their experiences in story form, were written by Charles Roberts, Samuel Scoville, F. St. Mars, J. O. Curwood and others.

About this time the work by Charles Livingston Bull came into prominence and many of these story books about animals, and similar stories that appeared frequently in magazines, were illustrated by him. Much of this work came out in the period between 1910 and 1930, twenty golden years for animal illustrators that brought to fame not only the work of Charles Livingston Bull, but also that of Paul Bransom, Lynn Bogue Hunt, Bruce Horsfall and others who specialized in animal pictures. Photography was no competitor, for these were action stories about animals and no one has as yet found a way of posing wild animals so they can be photographed to illustrate an episode in a story. Yet, when we look at a colored motion picture like "Jungle Boy," we wonder whether it could not

be accomplished, even though at a terrific cost.

The first indication that photography might prove a competitor for the animal artist in natural history illustration came in 1902. At that time, "The Living Animals of the World" was published by Dodd, Mead. It came out with a fanfare to tell the world that here was a book with no pictures that were drawn from an artist's imagination, no sir! these were actual photographs. The book was a disappointment then and still is. Some of the "actual photographs" of fish were made from badly stuffed specimens. Many of the illustrations do not show the birds and animals at their best. It looks like a collection of photographs that were picked up here, there and everywhere. It seemed sufficient that these were pictures of animals. How good they were, apparently did not matter. A number of colored illustrations are obviously from paintings, though purposely left unsigned. This is quite obvious in looking at the cassowary, lizards, indigo finches, waxbills, etc., all in color and all certainly by artists and not photographers.

In 1905, C. G. Schilling's book "With Flash-



"Woofover," by Paul Bransom, is from "Brownie the Beaver," by Allen Chaffee, published by the Milton Bradley Co.

light and Rifle" was published by Harper. It was the result of one of the first attempts to photograph animals in the wilds of Africa. He must have worked under trying conditions and with inadequate film, for most of the photographs are fuzzy and out of focus.

The work of Martin Johnson is too well known to need description. Suffice to say that he not only took good pictures of wild animals, but he seemed to have an uncanny sense for the picturesque and a great many of his photographs are unusually beautiful in pose and setting.

Despite the inroads of photography in natural history illustration, it will be difficult for photography, colored or otherwise, to compete with the fine work of men like G. E. Lodge, Archibald Thorburn, H. Gronvold, C. R. Knight and H.

Jones, who illustrated W. Beebe's "Monograph of the Pheasants" published about twenty years ago, and the later condensed volume "Pheasants, Their Lives and Homes." These are something else than just pictures of birds. They show the birds at their finest, in their best pose and with beautiful backgrounds. The photographer might succeed in getting a picture of the bird, but the combination of showing the bird at its physical best, in a typical pose, and with good composition and pleasing background, is something that the camera will catch only rarely.

One would have to go a long way to find a work on ornithology as beautifully illustrated as is "British Birds," in four volumes by Archibald Thorburn, published in 1931 by Longmans of London. Thorburn drew from the birds, and not from imagination. He is a master of pose, which can make or break a bird painting. In addition, his settings are beautiful and where he can he adds a few wild flowers to enhance the setting.

The work of Francis Lee Jaques is also outstanding, both in the field of bird and animal illustration. His bird pictures in Dr. Roberts' "Birds of Minnesota" are little masterpieces. Jaques, who for many years worked on habitat groups for the American Museum of Natural History, goes to considerable trouble to gather his material. He traveled to Newfoundland, Central America, the South Sea Islands, to the British Isles and Switzerland, as well as from north to south in our country, to prepare for his pictures. The result is authentic birds in authentic settings, not stiff and formal, as in many bird plates, but with proper composition, natural attitudes and settings that sing of the outdoors.

The late Louis Agassiz Fuertes was another zealous worker in the field of bird painting, whose illustrations filled many volumes. He too traveled far to obtain the specimens and proper setting for his pictures. South America, Mexico and Africa were fields for his brush, as well as many parts of our own country. He collected thousands of specimens and painted careful studies for reference in his finished paintings.

Carl Rungius is known as a painter of big game animals rather than as an illustrator, but his work has been used to illustrate articles and books on natural history. The wilds of Canada and our own country are his studio. There he



Charles Livingston Bull's style is well shown by this drawing of a Harpy Eagle, now owned by Dr. William Beebe.



"Cabot's Tragopan," by Archibald Thorburn, from Dr. Beebe's "Monograph of the Pheasants."

has found his models and the authentic backgrounds in which he places his subjects.

Carl Rungius goes to the wilds because his models are rarely found in zoological gardens and he feels that his animals pose better in the wilds than in zoo paddocks. Also, he says that "the setting is practically as important as the animal itself."

Animal pictures as produced by Rungius, Kuhnert, Thorburn, Jaques, Bransom and other masters of this art will always stand by themselves. Photography will never replace these, since animal drawing and painting are not simply a matter of showing an animal in a picture. The artist deals with pose, composition, color harmony and proper accents. No mechanical device that was ever invented can take the place of the artist's ability to arrange a picture. The camera takes what is set before it and only that.

There is at present a crying need for some learned zoologist to write another great work on the natural history of the mammals of the world. Most of the great works mentioned have long been out of date and the information is inadequate, since the wilds of the world have long

been opened to man and much more complete information is now available. You will look in vain in the works of Vogt, Brehm, Lydekker and others, who compiled their information in the 'eighties and 'nineties of the last century, for information about the Bongo, Okapi, Pygmy Hippopotamus and other beasts that were discovered after those natural histories were written. There is no mention of the Lesser Kudu and other well-known animals. Even much of the information given about animals that were known at that time is very meagre and there are many descriptions that end with, "Little is known about this animal in its natural habitat."

A work of this kind, well illustrated with colored pictures painted by outstanding animal artists and, perhaps, some of the good photographs that have been taken of animals in zoological gardens and in the wilds, by photographers who know their business, would do much to bring the natural history information of the mammals up-to-date. One who knows what he is writing about, and artists who know their animals, are needed. This combination should not be difficult to find these days.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since the last issue of this magazine are the following:

<i>Fellows</i>	
Dr. Arthur A. Allen	Dr. Daniel Merriman
Dr. Alfred E. Emerson	Dr. David Nachmansohn
Dr. Leonard J. Goss	Dr. J. F. W. Pearson
Dr. W. A. Hagen	Clifford Pope
<i>Life</i>	
José Maria Sainz G.	
Mrs. Mary VanderPyl	
<i>Annual</i>	
Donald Wilson Cragin	Gustaf A. Nyden
William A. Eldridge	Jack A. Saul
Barney Figowitz	Dr. Ernst Schmerl
Mrs. Pearl Goldberg	Riley Stanley
Jack Lesser	Harold D. Tompkins
W. O. Whitfield	

"JUNGLE PEACE" GOES OVERSEAS

Dr. Beebe's book, "Jungle Peace," has just been republished by the Armed Services Editions in an edition of 75,000 copies for free distribution to the soldiers and sailors overseas. These special service editions are paper-bound, printed in clear type, measure 4 x 5½ inches, weigh less than 2½ ounces, and cost only 7 cents to manufacture.

The book originally was published by Henry Holt & Co. and has gone through twenty-one editions. It is concerned with the work of our Department of Tropical Research in British Guiana.

NEW TECHNICAL PAPERS

Published in *Zoologica*, the quarterly scientific journal of the New York Zoological Society, were the following papers:

- New American Cerambycidae (Coleoptera) from British Guiana and Costa Rica. By W. S. Fisher.
- Cerambycidae (Coleoptera) from Caripito, Venezuela. By W. S. Fisher.
- The Metamorphosis of *Synodus foetens* (Linnaeus). By C. M. Breder, Jr.
- A Revision of the Family Nectariniidae (Sunbirds). By Jean Delacour.
- Two New Species of Fishes (Gymnotidae, Loricariidae) from Caripito, Venezuela. By Leonard P. Schultz.
- A Melanotic Tumor in the Silverside, *Menidia beryllina peninsulæ* (Good and Bean). By Ross F. Nigrelli and Myron Gordon

The papers were published in Vol. XXIX, Part 1, on May 10.

HARRY RAVEN

Afflicted with a variety of obscure tropical infections incurred in the course of his travels in remote parts of the world, Henry Cushier Raven, Curator of Comparative Anatomy at the American Museum of Natural History and Associate in Anatomy at the Zoological Park, died on April 5, 1944. On May 8 several hundreds of his relatives, friends and collaborators gathered at the Museum to honor his memory. Eight men of note, all from different though related fields of endeavor, spoke of "Harry," as he was usually known. All were in difficulties in the search for words. Not, however, the usual difficulties of encomium-hunters, who fumble for kind things to say of the departed. This time, the fumbling was a sincere acknowledgment of the impossibility of expressing the high regard in which Harry was held. Words of praise were spoken and the finest things one man could say of another were said. But unspoken thoughts, for which expression could not be found, remained in the minds of all.

Harry Raven would never have done for Hollywood. In fact, no one but a fellow explorer, without previous acquaintance would ever have judged him for what he was. Slender, of medium height, with quiet, self-effacing bearing, there was nothing of the accepted idea of an explorer about him. But there was a something in those clear blue eyes that keyed the character that lay behind them.

Just under 55 at the time of his death, Harry Raven had seen more of the world than most men see in greater spans. Australia, the East Indies, Africa, Asia and Greenland, all had been the scenes of his activities. Always willing to share his knowledge, Harry was the first thought for aid in the solving of knotty problems. All will regret that much of what he knew will never appear in print.—Lee S. Crandall.

**RANIGANJ MEETS THE WORLD—ONE OF THE THREE
BABY TIGERS NOW ON EXHIBITION IN THE ZOO**





NEWS OF BERLIN ZOO

American newspapers some time ago reported that Allied airmen had heavily bombed the neighborhood of the Berlin Zoo but few details of the damage done were available. Apparently more was learned in London, for Captain Delacour has received from a friend on the London Zoo staff the following account published in a London newspaper:

No More Zoo

All plans for reopening the Berlin Zoo in the spring are now temporarily abandoned.

Professor Heckt, head of the zoo, announces that it is impossible so far to get new glass for the wrecked bird house and that new damage done to the zoo in the most recent raids would mean "entirely rebuilding the lion cages, the elephant house, the antelope house, and the snake house."

Heckt says an artificial mountain had been built out of rubble from the damage in previous raids and was to be used by various goats and other mountain animals that survived. The bombs last week knocked the artificial mountain down.

The only exhibits now in the zoo are a few squirrels, two or three rabbits, some porcupines, and two shell-shocked apes.

The principal occupants of Berlin Zoo, or what is left of it, are hundreds of rats. The number of rats in Berlin — meaning the four-legged ones — is rapidly increasing. Large quantities of rat poison are being distributed among the ruins, but the rats still scamper in droves across the city.

PUBLICATIONS OF INTEREST

LIFE WITH ALICE, Forty Years of Elephant Adventures. By DICK RICHARDS. 67 pages, 24 illustrations. Coward-McCann, Inc., New York, 1944. \$2.00.

As far as I know, this is the first time any animal keeper in any Zoo has written a book about his experiences — for Author Dick Richards is *our* Dick Richards, keeper of our Elephant House, and his forty years of elephant adventures mostly were passed in the Bronx Zoo. Any other animal keepers who hanker to follow in his trail will do well to read his "Life with Alice" and model their tales accordingly, for this unpretentious account fairly shines with the essence of good keepership — a sympathetic, understanding, affectionate relationship between the man and his animals.

Dick Richards started his animal career as a circus man and began learning about elephants back in 1905, in the old Hippodrome. He made all the classic mistakes — tried to push an

elephant into position, got his foot stepped on by the pachyderm, was caught in the middle of a stampede. But he learned about elephants.

Later he took a job at Coney Island as an elephant man and he tells the story of how he talked Dr. Hornaday and Dr. Blair into buying the troublesome Alice for the Bronx Zoo — with the sequel that when Alice wrecked our Reptile House, Dick was summoned to handle her, and stayed on at the Zoo.

That was in 1908 and the rest of Dick's forty years with elephants have revolved around Alice and our Elephant House. He tells the stories of all of Alice's escapades of those years and a few yarns about his other pets — particularly, Pete, the hippopotamus. The death of Alice last year was a hard blow to Dick. Young Judy occupies Alice's stall now and she is a good elephant . . . but she isn't Alice.

"Even as I feed her and do the things for her I did for so many years for Alice, I sometimes almost seem to hear Alice chirp at me, asking for her hose. Or, when someone shoves a pail across the floor, I seem almost to hear her shoving hers around. And I wish that I could feel her trunk in my pocket again, searching for something to eat.

"I'd give a dozen Judys, and almost anything else, I think, except, perhaps, old Pete, to feel Alice's trunk doing that once more."—W. B.

ANIMAL FACES. By R. MARLIN PERKINS. Foster & Stewart, Buffalo, N. Y., 93 pp., 84 photos. \$1.50.

The author and photographer responsible for this little book of animal photographs was Curator of the Buffalo Zoological Gardens and formerly was Curator of Reptiles at the St. Louis Zoological Gardens. His long experience with wild animals has given him an excellent background for judging their emotions, disposition and character.

The introduction sets forth the author's contention that the facial expression of an animal gives a good clue as to what is going on in its mind and the amateur observer is told what to look for in attempting to "read the faces" of a number of different animals. The eighty-four portraits of mammals, birds and reptiles make an interesting collection. Of these the Chimpanzee provides the most enlightening series. But each and all of them give good opportunity for the study of animal character.—C. W. LEISTER.

XLVII • No. 4

JULY-AUGUST, 1944

ANIMAL KINGDOM



BULLETIN, PUBLISHED BY
NEW YORK ZOOLOGICAL SOCIETY

...ning, POISONOUS SNAKES OF NEW WORLD, by Clifford H. Pope • REPORT ON THE
"PACIFIC WORLD" SERIES, by Fairfield Osborn • THOSE BABY TIGERS, by L. S. Crandall

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York 20, N. Y.

PRESIDENT

Fairfield Osborn

FIRST VICE-PRESIDENT

Alfred Ely

SECOND VICE-PRESIDENT

Laurance S. Rockefeller

SECRETARY

Harold J. O'Connell

TREASURER

Cornelius R. Agnew

EXECUTIVE COMMITTEE

Fairfield Osborn, *Chairman*

Cornelius R. Agnew
Alfred Ely
Marshall Field

De Forest Grant
Warren Kinney

Harold J. O'Connell
William De Forest Manice

David H. McAlpin
Robert Moses
Laurance S. Rockefeller

BOARD OF TRUSTEES

Class of 1945

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely

Marshall Field
Childs Frick
Archer M. Huntington

David H. McAlpin
John H. H. Phipps

Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Class of 1946

George Gordon Battle
George C. Clark
F. Trubee Davison

Jay Downer
Robert I. Gannon

Robert Gordon McKay
Fairfield Osborn

Laurance S. Rockefeller
John M. Schiff
Frederic C. Walcott

Class of 1947

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez

De Forest Grant
Eugene Holman
Warren Kinney

Henry R. Luce
William De Forest Manice
Harold J. O'Connell

Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Ex-officio, The City of New York

The Mayor, Hon. Fiorello H. LaGuardia

Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

John Tee-Van *Executive Secretary*

Jean Delacour *Technical Adviser*

Edward Kearney *Manager, Facilities Dept.*

William Bridges *Editor & Curator, Publications*

Claude W. Leister *Curator, Education*

Sam Dunton *Photographer*

Sanford Miles *Comptroller*

ZOOLOGICAL PARK

Lee S. Crandall . *General Curator & Curator of Birds*

Claude W. Leister *Associate, Mammals*

Leonard J. Goss *Veterinarian*

John Tee-Van *Associate, Reptiles*

Grace Davall *Assistant to General Curator*

W. Reid Blair *Director Emeritus*

William Beebe *Honorary Curator, Birds*

AQUARIUM

Christopher W. Coates *Curator and Aquarist*

C. M. Breder, Jr. *Research Associate in Ichthyology*

Ross F. Nigrelli *Pathologist*

George M. Smith *Research Associate in Pathology*

Myron Gordon *Assistant Curator*

Homer W. Smith *Research Associate in Physiology*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*

Jocelyn Crane *Research Zoologist*

Henry Fleming *Entomologist*

George Swanson *Staff Artist*

Associates

William K. Gregory
John Tee-Van

Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

VOL. XLVII

AUGUST 4, 1944

No. 4

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York 20, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York 60, N. Y. Title registered with United States Patent Office.

Subscription, \$1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

Handsome Does As Handsome Is

Of all public institutions, a Zoo is no doubt the liveliest. It isn't just that the animals are all about. Somehow or other, barely a day goes by that something unexpected doesn't occur. Of course the animals are primarily accountable for this, for there is nothing dull about wild animals. They produce a constant succession of new situations, mostly minor ones, occasionally major ones. However, this is not intended to be of animals — but of people.

In this regard an agreeable and heartening thing happened this summer, at the reopening of the Reptile House. The interior had been renovated during the winter and this included a new treatment of the alligator pools. They had received general tidying up, new, tastefully planned rock work was built in, nice planting, in effect, just a general beautification. For ever so long these alligator pools at the end of a crowded Sunday were a sorry sight, floating with odds and ends of rubbish tossed in by an indifferent public, but on that first Sunday after the reopening, the near-miracle occurred. A great crowd filed through the building the whole day long but at closing time the pools were practically as clean and fresh as at the opening hour. "It's a 100% change," the headkeeper said later, "I don't quite understand it." He did, though, and so did everyone else. It is written, "A thing of beauty is a joy forever." All people will subscribe to that, but who would think that a big crowd, out for a day of recreation, would sense that — and live up to the sentiment! But they did that Sunday and they have ever since, not only at those pools but at other exhibits where the beauty that is nature's is most completely expressed.

It is a grand outlook for the Park's future development. Theoretically, when the whole place is keyed up to the highest pitch of perfectionism — which the post-war program promises and which somehow must be accomplished — there just won't be any litter at all for the Monday morning cleanup gang to cope with. All of which sounds like Utopia — which may be hard to reach even in a Zoo!

Fairfield Osborn

IN THIS ISSUE

Our Three Baby Tigers	Sam Dunton	COVER
The Poisonous Snakes of the New World	Clifford H. Pope	83
Progress Report on "The Pacific World" Series	Fairfield Osborn	91
The Cubs Are Growing Up	Lee S. Crandall	95
Yankee Naturalist in England	Capt. William J. Hamilton, Jr.	98
Capturing a Giant Anteater	William H. Chippendale	100
Behind the Scenes: News and Notes		104



Fig. 1. Coral Snake, *Micrurus fulvius*. Range: Southeastern United States and eastern Mexico in lowlands. Average length: 28 inches. Poisonous.



Fig. 2. Western Diamond-back Rattlesnake, *Crotalus atrox*. Range: Southwestern United States. Average length: Just under 5 feet. Highly dangerous.

The POISONOUS SNAKES of the NEW WORLD

Editor's Note

Early in June the Zoological Society published a 56-page booklet, "The Poisonous Snakes of the New World," by Mr. Pope. The subject is so timely, now that thousands of young Americans are coming into contact with raw nature for the first time — particularly the American tropics — that we plan to reprint the booklet in its entirety in three, or possibly four, successive issues of **ANIMAL KINGDOM** as a service to our Members and subscribers. The booklet is, of course, immediately available at 50 cents a copy, through the Publication Office, Zoological Park, New York 60, N. Y.

INTRODUCTION

Four groups of poisonous snakes are represented in the New World. In order of their importance as a menace to man they are:

Pit-vipers	about 75 species
Coral Snakes	about 50 species
Rear-fanged Snakes	few large, many small species
Sea-snakes	1 species

Only the pit-vipers and coral snakes will be discussed in detail, because they alone endanger human life.

The rear-fanged snakes have small, grooved poison-conducting teeth far back in the upper jaw that are readily brought into play only on objects actually taken into the mouth and chewed; in most of the species the mouth is small and the teeth are too short to inflict injury on man. These mildly poisonous reptiles closely resemble the innocuous species and learning to recognize them would be a major task requiring much concen-

By CLIFFORD H. POPE

*Fellow of the New York Zoological Society;
Curator of Reptiles of the Chicago Natural
History Museum*

tration. Anyone familiar enough with snakes to want to handle them freely must learn to find the sharply enlarged grooved teeth at the rear of the upper jaw bone; most persons will give all snakes a wide berth and thus be in little or no danger from the species belonging to this third group.

The single New World sea-snake is found along the western tropical coasts of Mexico, Central, and South America approximately from 25° north to 5° south latitude. It is ordinarily between twenty-four and thirty-five inches long and has a tail flattened like the blade of an oar. The sides and belly are usually brown or yellow, or brown bordered with yellow. Although its venom is extremely potent, this marine reptile never attacks man and is not even feared by swimmers in waters where it abounds. About fifty additional species are found in the warm seas between Australia and southeastern Asia. The largest of these scarcely exceed nine feet in length, so they cannot be responsible for the myth of the gigantic sea serpent.

GENERAL ACCOUNT BY GROUPS

THE PIT-VIPERS

A belief is widespread that a poisonous snake can be distinguished from a harmless one at a glance by the thickness of its body and the width of its head. There is an element of truth in this belief since pit-vipers do have thick bodies and broad heads; but two facts make it useless

as a criterion, if not actually dangerous: coral snakes have slender bodies and narrow heads; innumerable harmless snakes are shaped like pit-vipers.

All pit-vipers have two unmistakable characteristics; a deep cavity in the side of the head below the line of eye and nostril, and a pair of hollow, movable fangs in the front of the upper jaw. Unfortunately, neither of these can be seen at a distance, but both can be readily found on a dead snake or on one pinned to the ground by any convenient object; an angle iron screwed to the end of a strong stick is a good weapon to keep handy in areas inhabited by many snakes, the length of the stick of course depending on the nerve of the owner and the size of the snakes. The proverbial forked stick is impractical because, unless the site of the encounter happens to have conveniently soft earth, a fork of different depth is needed for every size of snake. A snake cannot be easily moved about with a forked stick, whereas one can be either held down or dragged about with a properly mounted angle iron.

It may be maintained that the better practice is to kill all snakes without attempting to determine which are dangerous. In certain areas where harmless snakes are exceptionally abundant and poisonous ones uncommon, this will be impossible, and learning to distinguish between the dangerous and the harmless kinds will save time and nervous energy. Some skeptics may say facetiously that giving directions requiring close approach to a snake is like telling a person to find out whether a substance is poisonous by eating some of it. This objection can be countered quite as facetiously by replying that the close approach is necessary because poisonous snakes did not evolve a skull-and-cross-bones pattern along with their poison apparatus. After all the rattlesnake does have his rattle. Ordinary intelligence must be used in avoiding dangers of every kind and the menace of poisonous snakes is no exception. Upon arrival in a new area, anyone can form the habit of examining dead snakes and thus begin to train the mind to recognize patterns and correlate them with fang and pit, or lack of such. In time, the close examination will be no longer necessary. The task is no harder than learning traffic signals and lights.

The fangs are teeth constructed like hypo-

dermic needles and are as sharp as the smallest sewing needles. Each one is fixed to a small, movable bone far forward on either side of the upper jaw (Figure 3). The identity of a fang is unmistakable if these facts are kept in mind: the fang is hollow, movable, and supported by a bone that bears no other teeth. The harmless snakes have in place of the fang a row of small, solid, non-movable teeth usually uniform in size. Occasionally two fangs will be found immediately adjacent to each other on one side in the pit-viper's mouth, a condition accounted for by the method of fang replacement (Figure 3). The fang-supporting bone has two sockets, one immediately next to the other, and into these sockets the newly developed fangs move alternately as the old fangs fall out. Thus a snake has a new fang in place a short time before the old one is actually shed. Careful dissection of the jaw will show a succession of fangs in various stages of development (Figure 3) imbedded in the soft tissue behind the supporting bone. The tips of the fangs develop first, the bases last.

The pit of a pit-viper is a complex sense organ having two cavities separated by a thin membrane richly supplied with nerves. The outer cavity is readily seen and freely open to the outside; the inner one is concealed and opens only by a tiny hole or pore just in front of the eye. The function of this organ long baffled scientists but recent experiments indicate that it enables pit-vipers to discriminate between nearby warm and cold objects. When an endless chain of light bulbs is moved in front of a pit-viper, it strikes more frequently at the warm than at the cold ones even though all the bulbs are wrapped so that they look alike. Presumably warm-blooded prey is more readily detected by snakes possessing a pit.

New World pit-vipers vary greatly in size, several species not reaching a length of three feet, others occasionally exceeding nine. All have the characteristic broad head commonly associated with poisonous snakes. Thick bodies are the rule that is not without exception. In temperament these reptiles vary not only from species to species but from individual to individual of the same species. Like other snakes, they do not have to coil to bite or strike but strike harder and farther from a coil just as a boxer



Fig. 3. Skull of a pit-viper (Bushmaster) showing functional as well as smaller reserve fangs. One of the two fangs on the right side of the skull is about to be shed.*

delivers his most dangerous punches from a fighting stance.

All are carnivorous and ordinarily feed on victims of their own poison rather than on carrion. Birds and small mammals make up the bulk of the food. In the New World, the young are born rather than hatched, with the sole exception of the bushmaster, a tropical species. Anyone who is not too timid may determine the method of reproduction of a dead snake by cutting the belly open: if a series of well-formed eggs is found, the snake cannot be a pit-viper unless it is the gigantic bushmaster which lays eggs three and a quarter inches long. To avoid confusing contents of the stomach with developing eggs, the cut should be made near the hind end of the body. At least one kind of pit-viper is found in every type of country from desert to tropical forest at altitudes from sea-level (or even below it) to 10,800 feet in the United States and to nearly 10,000 in South America. Most pit-vipers are terrestrial but some are aquatic and others arboreal.

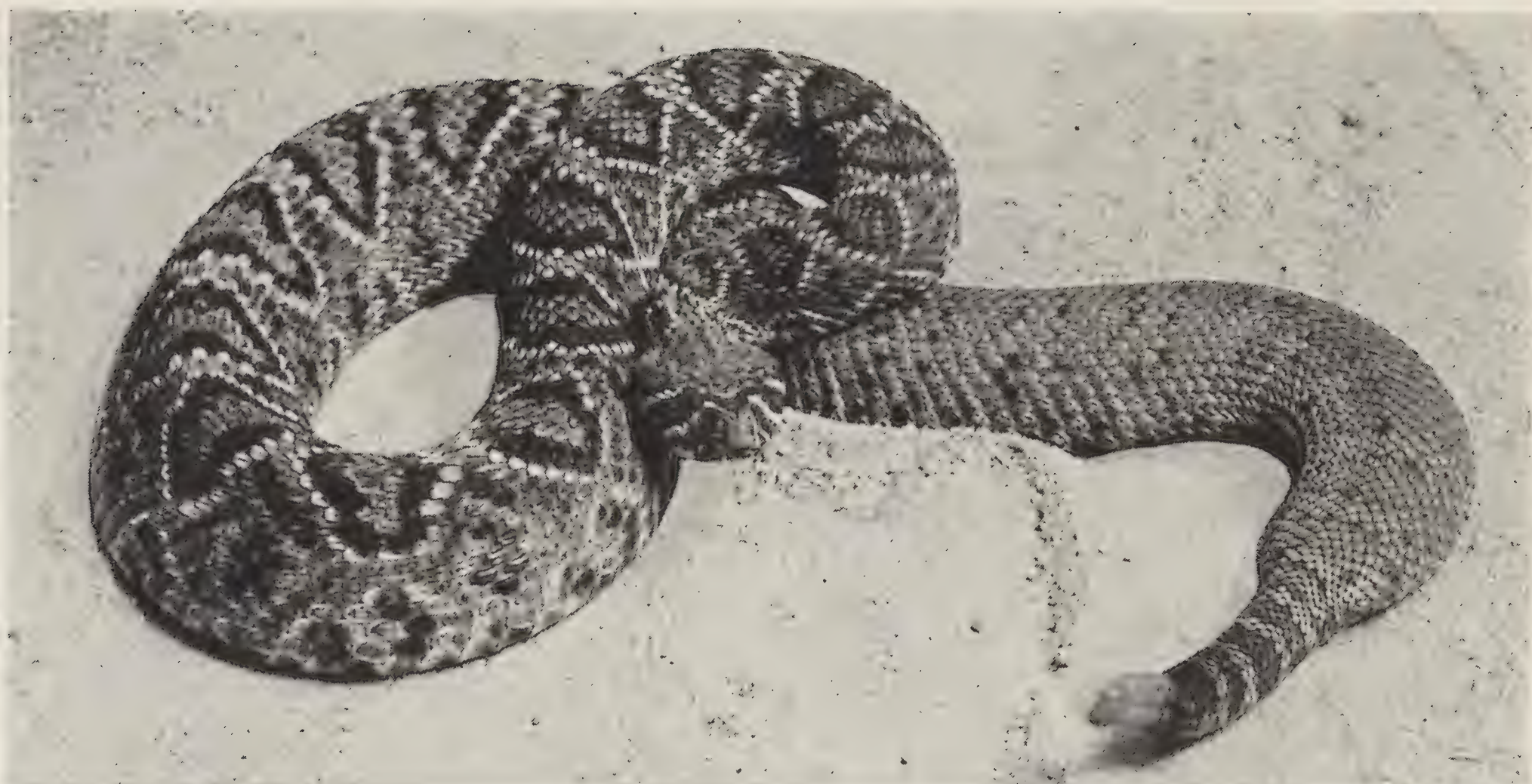
* Throughout this series of articles, the illustrations will be numbered consecutively, as they appear in the original booklet.

Pit-vipers are conveniently divided into two groups, one with a rattle on the end of the tail, the other without. Most of the pit-vipers without rattles are tropical reptiles about which little is known and the foregoing generalizations are all that can be wisely made. In contrast, the more homogeneous rattlesnakes (including neither arboreal nor aquatic kinds) have been so intensively studied by such herpetologists as Howard K. Gloyd and Laurence M. Klauber that certain facts can be stated about them as a whole.

THE RATTLESNAKES

(Pit-vipers with a Rattle)

In his monograph of the rattlesnakes, an exclusively American group of reptiles, Gloyd recognizes forty-five kinds (species and subspecies) and two have been described since the publication of his work in 1940. By disregarding the less clean-cut distinctions, the forty-seven may be reduced to twenty-seven full species, or obviously different kinds. The group range extends from extreme southern Canada southward to Uruguay. The center of differentiation is north-



Upper — Fig. 4. Diamond-back Rattlesnake, *Crotalus adamanteus*. Range: Coastal strip of southeastern United States. Average length: Just over 5 feet. Highly dangerous.

Lower — Fig. 5. Western Diamond-back Rattlesnake, *Crotalus atrox*. Range: Southwestern United States. Average length: Just under 5 feet. Highly dangerous.

ern Mexico and adjacent United States, and only in this area are many kinds found together. Over the remainder of the United States it is unusual for more than two species to live in any one region; nowhere in either Central or South America do two occur. Six of the fifteen species found in the United States are both described and illustrated below and seven additional ones are illustrated (Figures 13-20). The two remaining species are known only from the extreme southeastern corner of Arizona and never exceed two feet in length.

The diamond-back rattler (Figure 4) is not only the largest of the rattlers but the heaviest poisonous snake known; the relatively slender king cobra of the Asiatic region reaches a length of eighteen feet four inches and is several feet longer than any other venomous reptile. A large diamond-back may weigh more than fifteen pounds and reach a length of a little more than seven feet without the rattle which herpetologists never include in measurements of total length. It is often stated that this snake attains a length of more than eight feet. Such exaggerated statements rest on the fact that a fresh skin, even though it has been handled with utmost care, and without intentional stretching, is noticeably longer than the specimen from which it was taken. The western diamond-back (Figures 2, 5) is on the average a few inches shorter than the diamond-back and is the only other species that sometimes attains a length of seven feet. After these two come the banded (Figure 6), the tropical (Figure 30), the Mexican west-coast, and the Totonacan rattlesnakes, all growing to be more than five feet long, only the first, and that one but rarely, exceeding six. The average in contrast to the maximum length of the tropical rattlesnake exceeds that of the banded rattlesnake, so the former could be rated third.

About a fourth of the rattlesnakes might be classed as small, that is, adults are commonly no more than two feet long; only two, Willard's and the Carolina pigmy, never attain even this length.

A Pacific rattlesnake (Figure 9) three years old is sexually mature, females of this age bearing their first broods. It is probable that the other temperate kinds develop about as rapidly. There is little information on longevity, but one rattlesnake lived fourteen years in captivity.

There is a widespread belief that the age of a rattlesnake can be told by counting the rattles or, more accurately, the segments of the rattle. The truth of the matter is that several segments, probably two to four, are added annually and, after about a dozen have accumulated, the terminal ones begin to break off. It is obvious, then, that the segment count at best gives evidence of four or five years of life, a minimum age that also can be judged by the body size. The shape of a rattle is more useful in age determination than is the segment count: the first segment is the narrowest, and each one on a growing snake is noticeably wider than those preceding it, the result being a rattle tapering to a point. After growth ceases, the segments are equal in width and the rattle, the early segments of which have been lost, no longer tapers. A segment is added at each change of skin.

Most snakes vibrate the tail when annoyed and if dry vegetation happens to cover it a sound somewhat resembling that of the rattlesnake is produced. Thus harmless snakes are often mistaken for rattlesnakes. The speed of the rattle's vibration at 65° F. is forty-eight cycles per second and the sound, which is really a hiss, can be readily recognized by the experienced. This sound is useful to the snake; many animals, such as raccoons, weasels, and skunks, that attack harmless ones, or, like the bison, that might accidentally trample them, are warned at a distance of the rattler's presence. The old theory that the rattle helped the sexes to foregather for mating is not tenable because snakes lack external ears and are known to be deaf to sound waves of the air. Vibrations of solid objects in contact with the snake are quickly perceived.

The rattlesnake has a gentleman's code of honor: it rattles before striking, whereas the copperhead delivers its blow like a coward without warning. This popular anthropomorphic dictum has an element of truth since most rattlers are nervous reptiles that rattle at the slightest annoyance and continue to do so minutes on end. In experimenting with numbers of them, Manning, who observed from behind a screen, found one individual that would sound its warning if he let so much as the tip of his finger come into its range of vision. In contrast to this, an occa-



Upper — Fig. 6. Banded Rattlesnake, *Crotalus horridus*. Range: Eastern United States. Average length: 45 inches. Highly dangerous.

Lower — Fig. 7. Banded Rattlesnake, *Crotalus horridus*. This is an exceptionally black individual.



Upper — Fig. 8. Prairie Rattlesnake, *Crotalus viridis viridis*. Range: Great Plains region of the United States and extreme southern Canada. Average length: 3 feet. Highly dangerous.

Lower — Fig. 9. Pacific Rattlesnake, *Crotalus viridis oreganus*. Range: Pacific region from extreme southern Canada to northern Lower California. Average length: 3 feet. Highly dangerous.

sional one even when encountered in the wilds, refuses to rattle until actually touched. Reptiles are cold-blooded and do not react quickly in cool weather, a fact that should be borne in mind during spring and autumn for it is then that any rattlesnake might be reluctant to rattle.

The method of reproduction is uniform, all the species bearing the young alive. The number varies from three or four to as many as twenty-four in a brood. Generally speaking, three groups of approximately equal size can be recognized: those that have, respectively, about five, ten, and fifteen young at a time. It has always been assumed that a female reproduces once a year, but recently evidence has been found that, in the northwestern part of this country, a brood is borne every alternate year. The new-born snakes shift for themselves, are well supplied with venom, and do not hesitate to use their fangs.

The feeding habits are similar to those of pit-vipers in general with small mammals forming the basis of the diet. Birds are sometimes taken; a few species eat lizards or amphibians.

No habit of our rattlesnakes has attracted so much attention as that of gathering in autumn at certain sites called "dens". These dens, always well known to the local populace, are often visited by bold persons who slaughter the sluggish snakes as they bask in the weak sun of Indian summer. In rugged, mountainous country hundreds of snakes may congregate on a southern slope before retiring for the winter into numerous deep crevices beneath boulders. Under such conditions they cannot be caught in numbers, but in more open country, where they are often forced to enter a few isolated crevices, trapping them in this manner is easy. In the early winter a stove-pipe is cemented into the mouth of a crevice so that it opens over a barrel. The snakes, upon emerging in the spring, fall into the barrel and of course cannot escape. This habit of hibernating en masse has not been thoroughly investigated, so no one knows whether the same snakes return year after year to a site and how far afield the inmates of a den wander

through the summer. Many other interesting questions come to mind, for the study of snake behavior is yet in its infancy.

THE CORAL SNAKES

Coral snakes are a real stumbling block to the inexperienced person who is learning to recognize poisonous snakes. This is because these deadly relatives of the cobras do not have the short, thick bodies and wide heads commonly associated with dangerousness in snakes. The brilliant cross-band combinations of coral snakes — black with red and yellow (or white) or black with red or yellow (or white) — are found on many common harmless kinds. Coral snakes have a pair of fixed fangs in the front of the upper jaw but these are so short and well concealed by the gums that only a careful examination under a lens will reveal them. Fortunately, there is a marked difference in defensive behavior between coral snakes and their so-called harmless "mimics": the former never raise the head and neck in an S-shaped loop to strike after the manner of the ordinary snake; instead of striking, they bite by jerky side swipes. Many individuals are reluctant to bite at all and persistently try to hide the head under a coil of the body.

Approximately fifty kinds of coral snakes are known, their range embracing all of tropical America. In the north, they reach the low coastal plain of our southern states; in the south, the Territory of Rio Negro, Argentina. All types of country are frequented by these secretive snakes that seldom wander abroad during daylight hours. The largest kind never does exceed five feet in length, and only rarely attains such a size. The chief items of the rather specialized diet are snakes and lizards. The first specimen of a certain kind of harmless snake that inhabits Florida was actually discovered in the stomach of a coral snake (Figures 1, 25). Presumably, all the species lay eggs; the reproductive processes have been investigated even less thoroughly than other aspects of the life history.

(To be continued)

Progress Report on "The Pacific World" Series

Prepared by **FAIRFIELD OSBORN**
Chairman of the Publication Committee

IT'S WONDERFUL what will happen when an idea catches hold and a number of men, under the impetus of a "group inspiration complex," really get moving to convert the idea into a reality.

This miracle of sorts is exemplified by the creative work being done on the series of books summarizing the natural history of the Pacific, now happily approaching its culmination.

The first general book of the series, "The Pacific World" has already been published, with an initial printing of 100,000 copies for the Armed Services and an edition of 10,000 copies for the civilian public. The book appears to be meeting with a very fine response indeed.

As we have already reported, eight supplementary books have been planned, each concerned with details of one phase of natural history. Each book presents a most difficult challenge to the authors, because of the vastness of the area to be covered and the variety of life and of physical conditions. Certainly the authors are rendering a valuable, and in many respects unique, service in preparing these books. Arrangements have been concluded for their publication for distribution to the Armed Services and negotiations are under way for the trade publication of the entire group. The names of the various authors and the state of preparation of each book, are:

MAMMALS OF THE PACIFIC WORLD

The authors of this book are Dr. George H. H. Tate, Dr. John Eric Hill, and Mr. T. Donald Carter of the Department of Mammals of the American Museum of Natural History. This book has been completed and the Armed Service edition is about to go to press. An edition for the public is also about to be printed.

PLANT LIFE OF THE PACIFIC WORLD

Dr. E. D. Merrill, Director of the Arnold Arboretum. The work is virtually completed.

NATIVE PEOPLES OF THE PACIFIC WORLD

Professor Felix M. Keesing, School of Humanities, Stanford University, has prepared this volume, now in its final stage of preparation.

REPTILES AND AMPHIBIANS OF THE PACIFIC WORLD

Mr. Arthur Loveridge, Curator of Reptiles, Museum of Comparative Zoology, is writing this book. To be completed by August.

INSECTS OF THE PACIFIC WORLD

Dr. Charles H. Curran, Associate Curator of the Department of Insects and Spiders of the American Museum of Natural History, is preparing this book. About two-thirds completed.

MARINE LIFE OF THE PACIFIC WORLD

The contents of this book fall into three sections, the authors of which are as follows:

Fishes — Mr. John T. Nichols, Curator of Recent Fishes, American Museum of Natural History.

Marine Invertebrates — Dr. George H. Childs, Scientific Assistant, Department of Invertebrates, American Museum of Natural History.

Mollusks — Dr. Paul Bartsch, Division of Invertebrates, United States National Museum.

This book is now in its early stages and it is hoped that it will be ready in late autumn.

BIRDS OF THE PACIFIC WORLD

This book will be written by Dr. Ernst Mayr of the Department of Birds of the American Museum of Natural History. Due to other pressing engagements of authorship, Dr. Mayr has as yet been unable to commence it but expects to start work on it shortly.

PHYSIOGEOGRAPHY OF THE PACIFIC WORLD

The idea that this book should be included as a part of the series took form only recently. Arrangements for its writing are now being made.

92

THE DISTRIBUTION OF REPRESENTATIVE MAMMALS FROM THREE CONTINENTAL SOURCES

Island Group	Representative Animals	Chief Sources of Animals	Remarks
NORTH TEMPERATE (NORTH ASIATIC AND NORTH AMERICAN)			
Kurile (continental) and Aleutian chain (continental) and partly oceanic)	Bears, weasels, wolverines, seals, rabbits, squirrels, field mice	North Asia and North America	The Aleutian Islands contain fewer species the farther they are from the continental mainland.
Japan (continental)	Raccoon dogs, foxes, deer, Japanese macaques, squirrels, shrews, moles	Temperate and sub-tropical Asia	Animals derived mainly from the temperate zone and to a limited degree from the cooler tropics.
TROPICAL ASIATIC AND MALAY			
Formosa (continental)	Hedgehogs, bears, martens, clouded leopards, muntjacs, sambars, macaques	Tropical Asia and North Asia	Mammals scarcely to be distinguished from those of Fukien Province, China.
Luchu chain (continental)	Hares, pigs, flying foxes, shrews, mice	Tropical Asia and North Asia	Animals far more limited in variety and number than those of Formosa.
Greater Sunda Islands (continental): Sumatra, Java, Borneo, Bali	Orangutan, sun bear, sambar deer, rhinoceroses, flying, tree and ground squirrels, brush-tailed and true porcupines, pangolin	Tropical Asia and Malay Peninsula	The present-day wonderfully rich animal life is thought to have been preceded by an even richer population, known from its fossil bones, which included mastodons, primitive hyenas, and saber-toothed tigers.
Wallacea (oceanic): Philippines, Celebes, Moluccas, Lesser Sunda Islands	Tamarau and anoa buffaloes, babirusa, sambars, phalangers (part)	Tropical Asia and Malay Peninsula, both ancient and recent colonists; and Australia-New Guinea	Some of the islands contain a few Australian animals in addition to representatives of many of the continental groups. All types become fewer the farther the island is from the continent of origin.

THE DISTRIBUTION OF REPRESENTATIVE MAMMALS FROM THREE CONTINENTAL SOURCES

Island Group	Representative Animals	Chief Sources of Animals	Remarks
AUSTRALIAN			
Australia, Tasmania, New Guinea (continental)	<i>Egg-laying forms:</i> Duck-billed platypuses, spiny anteaters <i>Pouch-bearing forms:</i> Marsupial moles, phalangers, kangaroos, wallabies, koalas, wombats, Tasmanian devils, thylacine wolves <i>Placental mammals:</i> Fruit bats and insectivorous bats, peculiar genera of rats and mice, dingoes	Extremely ancient to modern tropical Asia	The Australian continental group is noted for its two unique orders of primitive yet highly specialized animals: the monotremes which lay eggs and suckle their young, and the highly diversified marsupials which carry and nurse their young in pouches. During the ice age the Australian marsupials included many larger forms. Among these were kangaroos larger than the largest known today, giant phalangers with great shearing teeth, and wombats as large as tapirs.
Bismarck Arch.: New Britain, New Ireland; Solomon Islands (oceanic)	A small wallaby, cuscus phalangers, a bandicoot, flying foxes, insectivorous bats, peculiar rats	Australia-New Guinea	These islands support a restricted animal life.
New Zealand	Two kinds of insectivorous bats	Australia, ancient and recent	Excessively ancient and isolated islands.
MID-OCEAN ISLANDS			
Micronesia, Melanesia, Polynesia	Fruit bats, a few insectivorous bats	Life fragments from various of the foregoing, through a long space of geological time	The grouping of these islands according to their native peoples has little application in zoology. The only mammals that reached the remote oceanic islands without human aid were bats.

This concise presentation of the origin and distribution of mammalian life in the Pacific area was prepared by Dr. George H. H. Tate, Dr. John Eric Hill, and Mr. T. Donald Carter of the Department of Mammals of the American Museum of Natural History. It was published in "The Pacific World" in the chapter on mammals and has aroused a great deal of interest.



Prince and Jenny, the parents of our three Tiger cubs, are magnificent animals in point of exhibition—but complete failures as parents. It was because of Jenny's shortcomings in this respect that her babies had to be reared by Mrs. Fred Martini, wife of the Lion House keeper. This striking photograph is the work of an amateur, Mr. Alfred A. Alsleben of Woodhaven, N. Y., through whose kindness it is reproduced here.

Continuing the story of how we reared our baby Tigers, first in an apartment and now in the Zoo.

The Cubs Are Growing Up

By LEE S. CRANDALL

THE STORY of our three baby Tigers, Raniganj, Rajpur and Dacca, born on February 8, 1944, was carried to the age of five weeks in the issue of *ANIMAL KINGDOM* for March-April, 1944. Weighing less than three pounds each at birth, they ranged from 7 pounds 6 ounces to 9 pounds 3 ounces when we left them then. Fine and bouncing though they were, we knew that our troubles were by no means ended and that unknown perils lay ahead. Now, from our vantage point of eighteen weeks (June 13), with the largest cub weighing 29 pounds, we can calmly record events as they occurred. But this pleasant state of mind was only achieved after many anxious hours.

In order to avoid the risk of rickets, when the cubs were a month old ten drops of Vi-penta daily were added to the mixture of evaporated milk, water and lime-water. Later, dicalcium phosphate was added, as a further precaution.

About the middle of March, one-half teaspoonful of liver juice was added to the diet, with no ill effect. The babies were walking unsteadily about Mrs. Martini's apartment by this time and quickly learned to scramble up to the soft cushions of couches and chairs. Then, too, they showed the first inclinations toward play, which rapidly developed into boisterous but harmless maulings of each other.

During all this time, we had constantly in mind the problems of teaching the cubs to lap and to eat meat. The first actual attempts to make them lap milk began on March 21, when



RAJPUR: Slow, fat, lazy . . .



RANIGANJ: Furtive? Or "sweet"?

DACCA: A hoyden, always sweet...





The baby Tigers were only one day old when this picture was taken and all three of them had been removed from the mother and turned over to Mrs. Martini. She started immediately on a methodical series of measurements and weight records, maintained while the babies were under her care.

the cubs were six weeks old, but no real success was achieved until two months later. Even then, they refused steadfastly, until the bottles were withheld for two or three days.

But the problem of how milk should best be taken was as nothing compared to the question of meat. Somewhere in the course of weeks, young Tigers must give up a liquid diet and turn to stouter viands. A mother Tiger solves the problem readily enough by dragging in a choice bit of entrails at just the right moment. But whatever tells the mother Tiger when that moment comes, failed entirely for us. So we could only fumble, not very cleverly. The cubs were nearly two months old when, on April 2, each received a tiny ball of raw chopped meat. They liked it very much but the effect was very bad. All became violently sick; poor Rajpur went into a coma, from which we thought he would never emerge. He finally became conscious but on the next day was stricken by a series of alarming convulsions. After this frightening experience, we were glad to allow the cubs to content themselves with the bottle.

A few days later, we resumed the attack by adding one-half ounce of meat juice to three

ounces of milk, once daily, instead of liver. The cubs assimilated this so well that we had to put wire netting tops on their sleeping boxes, to keep them from climbing over the three foot sides as they gained strength.

The big day finally came on April 24, when the cubs were one day short of eleven weeks old. We give each one a piece of horse rib, with a trace of raw meat attached. At these they licked and nibbled until the bones were like polished ivory. It worked like a charm and from that moment the infants have never looked back.

Little by little, more and more meat was allowed to adhere to the bone. Soon, chopped meat was added. At eighteen weeks, each cub received the following, daily:

3 lbs. chopped meat

$\frac{2}{3}$ tin of evaporated milk, with an equal quantity of water

$1\frac{1}{4}$ tablespoonful of cod liver oil

$1\frac{1}{2}$ tablespoonful of bone meal

At this time, weights were as follows: Rani-ganj and Rajpur (the two males), 29 pounds each; Dacca (the female), 28 pounds.

As the cubs progressed in size and strength, it became obvious that Mrs. Martini's home

could no longer contain them. A cage at the Lion House was furnished with a panelled glass front, to protect the cubs from well-intentioned food-throwers, and with a wooden floor and a curved background of pressed-board. On May 15, to the delight of our visitors, Mrs. Martini and her charges were moved, en masse, to the Zoological Park. Almost at once, they made themselves at home and the difficulties we had anticipated never materialized.

At the age of $4\frac{1}{2}$ months, they are flat-backed and sturdy; the bandy legs of cubhood are straightening out beautifully.

Constantly, we are asked how long Mrs. Martini can safely enter their cage. At present, of course, there is no question. The cubs regard her as their mother, obeying her orders when they understand and accepting the mild cuffs she occasionally administers when something goes wrong. Who can tell when this will end, if it ever does? When the cubs approach maturity, Tiger natures may very well assert themselves. In any case, we shall expect to exercise every precaution.

In the first report on our cubs, then aged five weeks, we pointed out the beginnings of what appeared to be definite infant personalities. At $4\frac{1}{2}$ months, these indications have been further developed. Raniganj remains furtive and unpleasant (a word Mrs. Martini is bound to resent — she says he is “sweet!”). Big-boned Rajpur is still slow, fat, lazy and good-natured and invariably cries for his foster-mother when he is left alone. “Little” Dacca remains the hoyden, always teasing her brothers to wake up and play, and always the leader in the rough-and-tumble that follows. If I had to call one “sweet,” I think it would be Dacca.

It is hard to have to realize that our lovely striped babies are fast growing up to be Tigers, and that soon their gray eyes, now just turning yellow, will glow with the fierce light that denotes the nature within. Already, they must be fed separately, to avoid inevitable conflicts. Now, only Mrs. Martini and her husband can enter the cage in safety. Every day the time grows nearer when even they may no longer do so.

Rajpur on the prowl, at the age of eleven weeks. When Mrs. Martini saw him stalking across the apartment toward her, with this purposeful look in his eyes, she knew it was a good time to seek safety on a chair or a table. “He doesn’t mean any harm,” she explained, “but he plays a little rough sometimes!”



YANKEE NATURALIST in England

By CAPT. WILLIAM J. HAMILTON, JR.

THE SLOW DEVELOPMENT of agriculture and settlement has produced all those features that render simple rural beauty to the English countryside. Narrow, winding lanes which follow the contour of the land, the lovely little cress-choked ditches with their thick-bordered hedgerows, the elms, oaks, ashes and magnificent beech woods make each little hamlet different. The thatch-roofed brick, clay or strong oak-timbered farmhouses and stone churches, many of which go back to Saxon times, the gorse-clad commons and in the north the heath-covered moors overlooking the larger towns, all add a picturesqueness that is sadly lacking in many parts of the States.

Here in the land that nurtured Darwin and Wallace, everyone is an amateur naturalist. Every schoolboy knows his thirty birds and is tolerably familiar with the common plants and trees. This general interest is reflected on the shelves of the larger bookstores. Here one may find well-illustrated handbooks on such specialized subjects as beetles, the larvae of British butterflies and kindred fields. Such volumes would scarcely attract the amateur in America, yet in war-time England they command a good sale.

My first sight of the British Isles was through a porthole. Screaming kittiwakes, familiar herring gulls and those great sea vultures, the black-backed gulls, wheeled in the wake of busy smaller craft. Lush meadows were apparent in the distance. After we were settled in our new Army post, I had opportunity to become better acquainted with some of the birds. Most conspicuous of all is the ubiquitous black rook, counterpart of our own crow. The bare branches of giant oaks support the dilapidated old nests of these birds. In late winter these become more

Quiet observations of British wild life, set down by a Cornell University zoologist in the lull before the invasion.

conspicuous as the rooks are busy adding twigs, mud, roots and straw. Rooks nest in colonies of five to thirty, some nests being so crowded that they appear to touch one another. The noisy youngsters keep up their incessant clamor from dawn to dusk. Associated with the rooks are the handsome and gregarious jackdaws, somewhat smaller and noisier. Their sable coats with shining gray napes glisten in the sun as they strut between the rows of new cabbage and sprouts. Their noisy chatter reminds one of the harbor gulls.

The English robin, or redbreast, is scarcely as large as a sparrow. His confiding nature makes him a welcome guest in every home in the kingdom. However cold and stormy, this pretty resident is sprightly and confiding, but pugnacious, other birds living in awe of him.

After mess, when other duties do not interfere, I walk through the paths of the post during the long evenings. Great wood pigeons tumble into the awakening ash, to fill their crops on the swelling buds. Much like our homing pigeon, they are somewhat larger, with a characteristic white half-moon splashing each side of the neck. The wild pigeon, incidentally, has lately risen to astonishing heights of price and popularity. Once hardly considered a bird, its cost could be counted in coppers. Today every London market bids for the bird and it has acquired the financial status of the pre-war grouse.

Along a narrow stream I startled a kingfisher. No larger than our bluebird, this living jet of color adds much to the charm of the waterways. Although its beauty creates a demand for the skin, the bird survives in our midst. Its greenish-blue back, cobalt rump and chestnut underparts strike a note of beauty long remembered.

In the early spring great flocks of lapwings flop heavily over the pastures and ploughed fields. By April they have paired, the male courting his bride in a wild, zigzag, frenzied flight. Far in the sky an unexpected song is heard. Above the roar of lumbering bombers returning from a mission, its changing tone reached me. Soon I could see powerful, quick-beating little wings as the skylark plummets to earth, and alights between rows of parked jeeps in a green pasture. I searched long for the nest, but without result.

At retreat formation one evening in late winter, I caught sight of a "white" bird flitting its solitary way on buoyant wings over the grassy fields adjoining the parade ground. As our formation was dismissed I temporarily forgot mess (my friends will find this hard to believe) and sought the lair of that cosmopolite, the barn owl. A short search soon revealed its retreat in the hollow trunk of a decadent elm. Later I filled a cigar box full of the pellets, undigested balls of fur and bones disgorged by all owls. When I spread these out on my cot and commenced to unravel the mystery of past Stygian feasts, my fellow officers had no end of sport with me. But as the pile of small skulls and bones grew, the joking turned to genuine interest; all too soon my frail cot was crowded with friends who insisted on lending a hand. Characteristic skulls of wood mice, bank voles, field and red-backed mice, rats and tiny shrews, with an occasional bird, were picked from the casts. Now I have a dozen assistants on my pellet hunts.

On our marches over the country, we see everywhere the evidence of rabbits, the same

fearful pest that caused such widespread destruction in Australia. Every hedgerow is honeycombed with their burrows. Since the demands of war have temporarily removed many hunters and game keepers, these pests have increased enormously and levy a heavy tax on crops. Occasionally a big hare will start up from a ditch and race across the fields of sprouting grain. I looked in vain for evidence of the muskrat, which gained a foothold in England some years ago. It threatened great damage, but a successful campaign to eradicate it was undertaken and the last rat was trapped. The British have met with less success in their unfortunate introduction of our gray squirrel. In the States we look upon Bannertail as an asset, a handsome guest of our parks and cities and legitimate game in the country, causing little or no damage. Here in Britain it is an unmitigated pest, destroying fruit, killing young trees and girdling large branches. Such is the penalty of exotic introductions.

In the past few months I have seen more foxes than ever I did in the States. Every train ride produces a few, quietly sitting beside some marshy strip or thick hedgerow, in expectancy of a fat mouse. Anathema to young lambs, foxes are now hunted at every opportunity, but despite sporadic chases, they are said to be increasing.

As I write, the long spring evening has at length darkened. We have just put up our black-out shades. We are all tired, only a few hours in from maneuvers. Just a little while back I lay on a mossy bed, carpeted by blue violets and wild yellow primroses, eating a hot meal from our field kitchen. A chaffinch uttered its "pink, pink," while a large, slate-backed, bar-bellied bird, with bowing head and fanning tail, uttered its plaintive but famous "cuckoo." The countryside was at peace. At my elbow, a strip of soiled silver foil lay half hidden in the moss, dropped by some Jerry to counteract radar. Even in the still beech woods the evidence of war was at hand.

Capturing a GIANT ANTEATER

By WILLIAM H. CHIPPENDALE, C.M.Z.S. (London)

As the Indians remarked, it is easy enough to capture a mother and baby, but not so easy to turn the mother loose and keep only the baby.

THIS ARTICLE—reminiscences, really—has been compiled from my diaries ranging over a period of many extremely interesting and happy years spent among the Indians and animals of the Paraguayan Chaco, more commonly known to the general public as the battle ground of the late Paraguayan-Bolivian conflict.

If one takes a map of Paraguay, one will see that the river Paraguay divides the republic in half, roughly from north to south, the western half being the Chaco. Never has a river split a country into two more contrasting parts, the peoples, language, topography, trees, flowers—even the very grass and earth—being completely different. No towns or villages scar the “Gran Chaco” and it is today just as it has been since time immemorial—jungle, swamps, creeks, plains and palm-belts, unspoiled by the ruthless hand of civilization, home of nearly all South American sub-tropical fauna and dwelling place of nomad tribes of Indian hunters. The zone of my experiences is right on Capricorn’s line and roughly in the center of the Chaco.

Some years ago I had received an urgent request for a pair of Giant Anteaters for the London Zoo as well as a request from an American Zoo, and as my usual well trained Indian boys were away after a Maned Wolf, I set about getting together an auxiliary gang of Indians who, although each was a born hunter, were not trained in catching live specimens for zoological

collections. I strolled over to the Indian “tingma” (village), consisting of a few upright poles and a rough grass roof, and took my accustomed place on the ground in the circle of half-naked Lengua Indians. We squatted around a smoking termite nest (which keeps the mosquitoes and other pests at bay) while young maidens passed the carved communal pipe of strong, wild, green tobacco from mouth to mouth. In their own laconic language I explained what I wanted, and especially my desire to obtain not old and decrepit animals, but half-grown or baby specimens.

There was the usual ten-minute interval (for Lenguas have plenty of time and never rush things), during which we all smoked in moody silence. Then suddenly Hakuk Igyewa (Orphaned-by-the-Rattlesnake) cleared his throat, spat reflectively at the smoke fire, and said:

“I have considered your words, but am afraid that we will have many difficulties in capturing a young Nai-yim. For, although Nai-yims are not uncommon in our forests, females with their young are not so frequently seen.

“And furthermore,” he added, “the young ones ride on the backs of their mothers, as you know, and the mothers me-oki (a Lengua word impossible to translate literally, but meaning, more or less: to-be-jealous-of-to-the-extent-of-dying-for) their offspring, and it is your wish that the mothers be not killed.”

His voice trailed off into doubtful silence. “It is, indeed, my wish that the mother’s life be spared,” I replied, “and once you capture the mother and her young one, I am sure we will find some way of parting them.

“Tomorrow, then, you and your companions will start for the ant-hill country in the north to search the plains and forests for Nai-yims.”

Six long weeks elapsed during which I heard news of the hunters only from the "chasquis" (runners) who came in from time to time with peccary and capybara skins. It appeared that the men were having great success with peccaries, capybaras and rheas, which they were also hunting for their daily meat, but had not come across even one Giant Anteater. Many Lesser Ant-eaters (*Tamandua tetradactyla*) they had found, however.

At the end of the sixth week, just as I was giving up the chase until the following dry season, Hakuk Igyewa himself silently appeared out of the forest path one morning and squatted on his haunches beside me.

"Thliyip nuk?" (Is it you?), said I, giving the Lengua salutation.

"Koo nuk," he grunted. "Artihe ikhim, meko koinaik marmigiyai. . . ." (It is I indeed; the sun is burning today and I don't think we shall have rain.)

We discussed the condition of the manioc root, the fatness of the peccaries this year, the scarcity of the "lolocho" (lungfishes) in their muddy dens—in fact, all the small talk of the Chaco Indian. Then, after twenty minutes of gossip, he finally got down to the news.

"We have cornered a female Nai-yim with its young, and now await your orders; they are at

the place of the-two-quebracho-trees-struck-by-lightning."

This spot I knew; it was about six miles away, through swampy country, and so I had horses saddled and Hakuk Igyewa and I set out.

At the two burnt quebracho trees, a score of hunters were squatting around a palm to which the female Anteater was tied by a plaited cow-hide lasso around her middle. She was a fine animal, but furious, and a baby that I judged to be about two months old was clinging to her back in monkey fashion. It was taking the situation calmly enough—gazing at us with sleepy, disinterested, beady eyes.

As I approached the mother silently sat up on her long tail, in kangaroo style, and awaited me with her muscular arms wide open and her claws ready to enfold me. Her long snout was weaving from side to side. The baby, now in a vertical position, still held on tightly and obviously was not going to fall off so we could drag it away.

The time had now come for me to make good my reassuring words that "once you capture the mother and her young one, I am sure we will find some way of parting them." I went back to the boys and we sat down to plan our campaign.

To approach too near those claws would be courting death, for we have known a horse to be



A baby Giant Anteater usually rides on its mother's back in such a position that the dark streak on its shoulder and back forms a continuation of that marking on the mother's body. This baby was born while the mother was in shipment from South America to the Zoological Park.

Facially, at least, the Lesser Anteater or Tamandua bears a strong resemblance to the Giant Anteater. It spends most of its time in trees and prefers termites as a steady diet.



disembowelled by one stroke. We all pondered silently. Suddenly, seeing one of the hunters plaiting a broken thong in his bolas, I had an idea: why not use a bolas?

To digress for a moment, I expect most of my readers will know that a bolas is composed of three longish leather thongs at the ends of which are leather balls, generally about the size of an orange. One ball is grasped in the hand and the rest are twirled swiftly round the head and then let fly at the legs of the fleeing quarry. The thongs entwine themselves round the legs and the victim is swiftly brought down.

It proved to be much easier than I thought. Waiting until the Anteater was on all four legs again, Hakuk swiftly moved up, twirling his bolas. He judged the distance perfectly, the bolas snaked whizzing through the air to envelope the forelegs. The Nai-yim wobbled a moment, caught off balance, and then slowly toppled over

on to her side, the baby meanwhile contentedly clutching its parent's thick mane. The Anteater now trumpeted shrilly and tore at the bolas with its back claws. The boys, however, swiftly got to work and trussed it up securely fore and aft. The baby was gently "unhooked" from its mother's back without any protests and sent home immediately with an Indian.

So far, so good. We now had our baby, and a beautiful specimen, too, *but* we also had an exceedingly angry mother trussed up and had to release her and then get out of her way—for these lumbering Anteaters can get along quite swiftly in that loping run of theirs. It was finally decided, after another council of war, that we would attach a 30-foot lasso round the forelegs, to be held at the extremity by two of the boys, while the back legs would be secured by another lasso with another two boys in the opposite direction. The lassos were duly fixed, both having

large and free-running slip knots, and the two sets of boys took up their positions at the ends of their respective ropes (incidentally I had picked out the swiftest runners, for obvious reasons). We sent the rest of the boys away to a safe distance and I then untied the original lashings round the legs, leaving only the lassos on, with the boys now pulling just hard enough to keep them tight. I mounted my horse and shouted to the hunters on the lassos to loosen up.

They shook their lassos in a snaking manner towards the Anteater, which loosened the slip knots, and then beat a retreat. The Nai-yim lay quite still for a minute or two. When she sensed that she was free again by the absence of the pressure of the lassos around her legs, she scrambled to her feet, stepped clumsily out of the nooses, shook herself, and—much to the disappointment of the boys, who were secretly looking forward to some fun—turned away from us and disappeared into the forest.

Upon reaching home I found that my wife had made up a bed for the baby Anteater in a thick sheepskin in a kerosene box on the kitchen floor. The baby was fast asleep and none the worse for its exciting day. The next morning we found "Aitkuk" ("Little One," as we called it) outside its sleeping can and busily licking up ants from the mud floor. The floor itself resembled a miniature battlefield, being pitted with excavations where an exploring claw had been searching for ants' nests. When it heard me it suddenly stopped and menacingly lifted one small but nevertheless businesslike claw in my direction. By picking it up swiftly by its back bristles, it was possible to examine the baby safely. I found it to be a fine young male, a

trifle on the thin side. So Aitkuk became one of the family and commenced training and preparation for his forthcoming ocean trip, as is necessary before a long voyage.

At first we allowed him his natural food of ants and termites in abundance, water and his entire freedom within a large outside enclosure. Incidentally we observed that his favorite ant was the red "fire ant" and its eggs, and utter contentment could be seen in his pig-like eyes when he had his long snout buried right up to the eyes in a fire ants' nest. Seemingly he cared not at all for the hundreds of angry and disturbed tenants swarming all over his body and head, each one of which packed a bite like hot pincers—at least for human beings! The Lesser Anteater, on the other hand, seems to prefer a juicy termite nest.

During the three and a half months that Aitkuk was with us, we gradually lessened the ants, substituting fresh milk into which was mixed chopped hardboiled eggs and very finely chopped raw beef. All this "weaning" process was, of course, in preparation for the animal's long journey and subsequent life in the Zoo, for even the best ship's cooks and the largest of Zoos cannot possibly find sufficient ants to keep a healthy Giant Anteater satisfied and contented.

As time went on, too, we increased the number of hours each day that he was shut up in a strong wire cage, and by shipping day he was quite contented in it, and thriving on his substitute diet. I think he must have had as comfortable a trip to the Zoo as any Anteater ever did, for we heard later that he arrived in fine condition, full of fight. He got that from his mother, I expect.

FISH OR FISHES? Even professional ichthyologists often have to stop to think whether the plural of "fish" should be written "fish" or "fishes." The Aquarium's rule (and it's generally accepted) is this: "fish" is used as a collective plural when more than one fish of the same kind are meant — thus, two herrings are "two fish." But the plural is "fishes" when different species are involved — thus, "one herring and one mackerel" are "two fishes." Dead fish, though, are always just "fish," no matter how many kinds are referred to.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

MME. CHIANG AND THE PANDAS

Some months ago John Tee-Van, the Zoological Society's emissary to China in 1941 to bring back our two baby Giant Pandas, sent his yearly "progress report" on their health and behavior to Mme. Chiang Kai-shek and her sister, Mme. H. H. Kung.

It was through the good offices of Mme. Chiang and Mme. Kung that the babies were obtained for presentation, through the United China Relief, to the children of America.

Mr. Tee-Van reported that we were still undecided as to the sex of the animals, although we believe the smaller one is a male and the larger a female. Incidentally, there is a great disparity in their weights as they grow older; they were 62 pounds and 57 pounds, respectively, when they reached the Zoological Park. The male now weighs 196 pounds and the female 293 pounds.

Mme. Chiang's letter follows:

HEADQUARTERS OF THE GENERALISSIMO
CHINA

Chungking, Szechuan
April 7, 1944

Dear Mr. Tee-Van:

Thank you for sending me a progress report regarding the pandas. I am glad to hear that they are getting on so well, and I wish to congratulate you upon the way that they have reacted to the care and attention you have been giving them ever since they exchanged the privations and uncertainties of forest life in Szechuan for the amenities of Bronx Park.

The indeterminate sex problem that they present will, no doubt, resolve itself in time. From your description, the female seems to show pronounced male characteristics while the male is ladylike in his eating habits and avoirdupois.

It gives Madame Kung and myself great satisfaction to learn that the pandas continue to be such favorites with the children of America. Even with the formidable increase in weight, they must be still the engaging creatures they were in babyhood. I return their greetings and would like you to give them some special *bonne bouche* to mark the occasion.

With my personal regards,

Yours sincerely,
MAY-LING SOONG CHIANG
(Madame Chiang Kai-shek)

40 AND 34 YEARS!

Two valued members of the Zoological Park operating staff retired this summer after extraordinarily long periods of service.

Dan Schoonmaker, "boss" of the machine shop, retired on June 30 after 40 years and 20 days of work, and Miss Annie R. Newman, assistant in the Department of Publication and Photography, on July 7 after an even 34 years.

Dan had the reputation among the staff of being able to "fix anything or invent anything," when some intricate problem of mechanical housekeeping arose. Miss Newman was equally omniscient and ingenious in her own work and had a wide acquaintance among the older members of the Society, many of whom invariably dropped into call on her on Garden Party day each year.

Both will be — and are, daily — truly missed.

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since the last issue of this magazine are the following:

ANNUAL

Colonel Walter A. Brown	Mrs. H. G. Hesse
Mrs. Hugh Bullock	Captain Raymond W. Lapham
Harry G. Collier	Norman J. Marsh
William P. Doelger	Mrs. Eric Maude
Alexis Doster	Mrs. Cornell Myers
Mrs. Ruth Grimes	Mrs. Nona Navin
Miss Marjorie M. Hensen	Mrs. M. Roessel
Mrs. Edgar Bauman	

PROTECTING TRUMPETER SWANS

Captain Jean Delacour has been appointed as a Collaborator of the Wildlife Refuges Branch of the Fish and Wildlife Service and late in the spring made a six weeks' tour of the west where he advised on questions relating to the preservation and propagation of rare species of native birds.

An immediate problem is that of the Trumpeter Swan, the largest of all wildfowl, which is now so reduced in numbers that it is believed not more than two hundred birds survive. Their present refuge is in several high mountain lakes in Montana and Wyoming.

Captain Delacour, with Leo Laythe of the Fish and Wildlife Service, visited refuges in Montana, Utah, Wyoming and Idaho, and prepared a long-term program that includes the establishment of specific refuges and breeding facilities.

1.673
59

ANIMAL KINGDOM



BULLETIN, PUBLISHED BY
NEW YORK ZOOLOGICAL SOCIETY

LIONS IN THE WILD, by Paul Bonnot • POISONOUS FISH, by Ross F. Nigrelli • POISON-
SNAKES OF THE NEW WORLD, II, by Clifford H. Pope • News and Notes from the Zoo

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York 20, N. Y.

PRESIDENT

Fairfield Osborn

FIRST VICE-PRESIDENT

Alfred Ely

SECOND VICE-PRESIDENT

Laurance S. Rockefeller

SECRETARY

Harold J. O'Connell

TREASURER

Cornelius R. Agnew

EXECUTIVE COMMITTEE

Fairfield Osborn, *Chairman*

Cornelius R. Agnew

Alfred Ely

Marshall Field

De Forest Grant

Warren Kinney

Harold J. O'Connell

William De Forest Manice

David H. McAlpin

Robert Moses

Laurance S. Rockefeller

BOARD OF TRUSTEES

Class of 1945

Cornelius R. Agnew

C. Suydam Cutting

Alfred Ely

Marshall Field

Childs Frick

Archer M. Huntington

David H. McAlpin

John H. H. Phipps

Clendenin J. Ryan

Herbert L. Satterlee

Harrison Williams

Class of 1946

George Gordon Battle

George C. Clark

F. Trubee Davison

Jay Downer

Robert I. Gannon

Robert Gordon McKay

Fairfield Osborn

Laurance S. Rockefeller

John M. Schiff

Frederic C. Walcott

Class of 1947

Archibald S. Alexander

Harry Payne Bingham

A. Raymond Dochez

De Forest Grant

Eugene Holman

Warren Kinney

Henry R. Luce

William De Forest Manice

Harold J. O'Connell

Dean Sage, Jr.

Landon K. Thorne

J. Watson Webb

Ex-officio, The City of New York

The Mayor, Hon. Fiorello H. LaGuardia

Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

John Tee-Van *Executive Secretary*

Jean Delacour *Technical Adviser*

William Bridges *Editor & Curator, Publications*

Sam Dunton *Photographer*

Edward Kearney *Manager, Facilities Dept.*

Claude W. Leister *Curator, Education*

Sanford Miles *Comptroller*

Quentin Melling Shubert, *Superintendent, Construction and Maintenance*

ZOOLOGICAL PARK

Lee S. Crandall . *General Curator & Curator of Birds*

Leonard J. Goss *Veterinarian*

Grace Davall *Assistant to General Curator*

W. Reid Blair *Director Emeritus*

William Beebe *Honorary Curator, Birds*

Claude W. Leister *Associate, Mammals*

John Tee-Van *Associate, Reptiles*

AQUARIUM

Christopher W. Coates *Curator and Aquarist*

Ross F. Nigrelli *Pathologist*

Myron Gordon *Assistant Curator*

C. M. Breder, Jr. . *Research Associate in Ichthyology*

George M. Smith . *Research Associate in Pathology*

Homer W. Smith . *Research Associate in Physiology*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*

Jocelyn Crane *Research Zoologist*

George Swanson *Staff Artist*

Henry Fleming *Entomologist*

Associates

William K. Gregory

John Tee-Van

Gloria Hollister

Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

VOL. XLVII

OCTOBER 2, 1944

No. 5

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York 20, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York 60, N. Y. Title registered with United States Patent Office.

Subscription, \$1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

What About 2000 A.D.?

The mountain peaks do not change. Aloof and snow-crested, they look down upon the forested slopes, the foot-hills and the plains where there is life and where, therefore, everything is changing. Man being outside the ken of this page, what of the other animals? They continue to exist, though diminished beyond belief even within the last few decades. Yet they survive — elk in fair numbers, moose here and there, big-horn sheep on some of the distant ranges, and small bands of black-tail deer in the aspen groves. Bear still nose around the mountain cabins, and beaver, in isolated localities, work the streams. Waterfowl wing down to the mountain lakes at dusk or flock by thousands during migration time into their marshland sanctuaries. Yet the country, when compared with its condition, say, in 1900 — a little more than four decades ago — seems almost bare of animal life.

What of the future? What of another four or five decades of change? Will the end of this century write *finis* to the animal life of the great West? The outlook, though hopeful, is still uncertain. The question cannot yet be answered. The existing National Parks and established game refuges are sufficient in number and size to provide breeding and living space, though winter ranges are still not adequate. These areas, held in trust for the Nation, are well administered and provide the bulwark of hope for the future. But in the last analysis public opinion, in the years to come, will be the deciding factor — whether or not the majority of the people awake to the situation and, before it is too late, take action so that the life of these varied and wonderful animals may be permanently protected. Once they are destroyed they will never appear again on the face of this earth — no, not now, nor even in the milleniums to come.

*Written while visiting the wild-life refuges
and sanctuaries in Wyoming and Utah.*

Fairfield Osborn

IN THIS ISSUE

Mute Swan	Nicholas F. Delagi	COVER
Marine Cousins of the Bears	Paul Bonnot	107
The Poisonous Snakes of the New World, Part 2	Clifford H. Pope	111
How Baby Kangaroos Get Into the Pouch		121
Fish May Be Poisonous, Too	Ross F. Nigrelli	122
Behind the Scenes: News and Notes		125



Photograph by John Tee-Van

Sea lion rookeries are, at certain seasons, the congregating place of hundreds of animals. Here the young are born into a world of continual uproar — the barking of the adults, the breaking of waves, the screams of sea gulls and the bawling of lost pups. This rookery is on the San Benito Islands off the coast of Lower California.

MARINE COUSINS of the BEARS

By PAUL BONNOT

*Assistant, Bureau of Marine Fisheries,
California Division of Fish and Game*

THE ANCESTORS of all living organisms began their existence in an aquatic medium. Some of them, after reaching a high degree of specialization, remained there; many gradually moved ashore and became adapted to a terrestrial life. A few of these land forms, perhaps because of ecological advantages, have again reverted wholly or partially to an aquatic mode of life. In some remote geological era the ancestors of the sea lions, mammals closely related to the bears, began to go to sea. Anatomical modifications were of course necessary — legs became paddle-like flippers. The body temperature could not be maintained in a consistently cold medium by hair and fur alone and there was developed, just under the skin, a layer of tough, spongy tissue impregnated with oil. The present day sea lions are well adapted to their marine environment but they are still in the process of acclimation. Young sea lions must be born on land and they cannot swim at birth, but must be taught that very necessary accomplishment.

Sea lions can be distinguished from the true seals by their small external ears and their ability to turn the hind flippers under and forward for locomotion on land. They use the front flippers for swimming. The external ears of the true seals are merely holes in the side of the head; their rear flippers are used for swimming and cannot be turned forward. Seal pups can be born in the water and swim readily at birth.

On the Pacific coast of North America there

On June 16 a sea lion pup was born in the Sea Lion Pool at the Zoological Park. Its adventures and mishaps as it learned to swim have so fascinated visitors to the Zoo that we thought an account of the life in the wild of these "marine cousins of the bears" would be interesting. Mr. Bonnot, who prepared the following article, has for many years worked for the preservation of the sea lions. In a later issue we expect to report on the weaning of "Benny," our active sea lion pup.

are two species of sea lions: the Steller (*Eumetopias stelleri*), with a range from Bering Sea to southern California, and the black or California sea lion (*Zalophus californianus*), that is found from middle California to the southern end of Lower California. The Steller is the larger of the two, herd bulls weighing up to 2,000 pounds while cows go to 800 pounds. California bulls weigh about 1,000 pounds and cows 500. The Stellers are light gray when wet and gray or light brown when dry; the Californias chocolate brown to black when wet and ochre yellow or brown when dry. Stellers make a deep guttural roar while the Californias have a yelping bark and will sometimes howl.

The rookery is an essential feature in the life history of the sea lion. Rookeries will be found on isolated points of the mainland, sand and gravel beaches on large islands, or, more often, on a bare offshore rock. The first impression of a visitor to the rookery is one of sound. The steady muffled crash of breaking seas mingles with the growling roar of the sea lions to produce a diapason which seems to fill all surrounding space. The uproar ebbs and flows, swelling to a crescendo and dying away to allow an individual voice to break through; a cow bawling for a mislaid pup or a pup bleating for its lost mother.

At irregular intervals on the rookery site are the great herd bulls, defending their chosen areas and the cows they have collected, against poaching by other aspiring progenitors. On most rook-

eries, where they have been shot up, even the herd bulls have a wholesome respect for humans and will go overboard as soon as one appears. At some places, however, where they have not had much contact with man they will not only hold their ground but will actually pursue a human being. The animals are not concerned with sanitary considerations and the terrain is generally slippery with feces and salt spray; a situation not recommended for playing tag with a very spry, aggressive, 2,000-pound animal! It therefore behooves the visitor to respect their dignity and give them plenty of room.

Under normal conditions the bulls fight among themselves very little. If they are disturbed, however, many will stampede through territory claimed by another and savage duels are fought, sometimes until one or both contestants are dyed a dull pink from blood. In these encounters some aspirant to herd bull status may get an inferiority complex by being soundly thrashed and chased clear off the main rookery, but otherwise they seem to suffer few ill effects, as their hides are thick and salt water is a very fair disinfectant.

The sea lion population on any given coastal area is more or less stable and evenly distributed except during the breeding season when it is concentrated on the rookeries. During the rest of the year individuals and small groups move up and down the coast within their range, although there seem to be no definite mass migrations, except for the seasonal movements of the Steller bulls. These practically disappear from the southern part of their range after the breeding season, and spend their time on the coasts of northern Canada and Alaska. This is probably nature's method of adjusting the population to coincide with the available food supply. It is a curious phenomenon that fish can be found in abundance in the immediate vicinity of a sea lion rookery while they may be relatively scarce or absent at other places along the same coastal area.

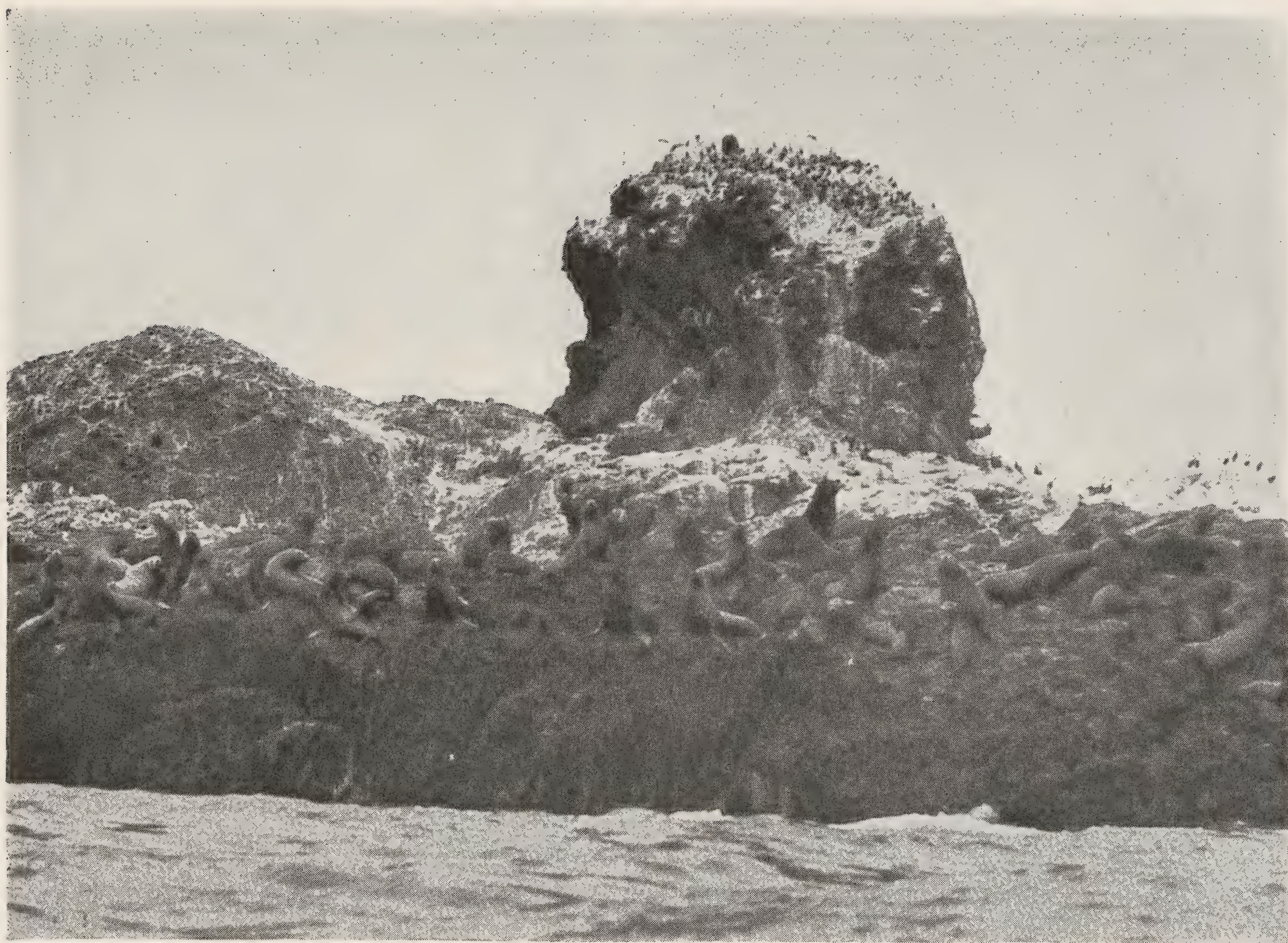
A few of the animals may be found near the rookeries at all times but from the end of May until the first of September the whole sea lion population congregates on them. The bulls usually arrive first. They pick out a situation to their liking and as the cows arrive they are incorporated into the various harems. A few days after she lands on the rookery the cow has her

pup and two or three days later she notifies her lord and master that she is ready to start all over again. The cows are pregnant practically all the time. After providing for the future the cow devotes herself to the maintenance and education of the current pup. Like most other young mammals, the pup drinks a great deal of milk, sleeps considerably, grows very fast and after a week or so begins paddling and splashing in tide pools and sheltered coves with its juvenile neighbors.

Most young mammals undergo a course of definite instruction from one or both of their parents in the fundamentals of adapting themselves to and obtaining a living from their environment. The sea lion pup, however, seems to acquire much of its education by its own imitative ability. Swimming is learned by splashing and paddling in tide pools and on shallow beaches. The first experimental attempts in deeper water are conspicuous by much jerky plunging and splashing. It is several months before the pups learn to coordinate their breathing and the smooth manipulation of the powerful front flippers necessary for successful submarine navigation.

Fish and other organisms are chased and caught; at first in much the same spirit that a puppy will pursue any smaller animal that will run. As the pup increases in size and appetite such captures are eaten to supplement the milk supply, which does not increase in the proportion demanded by the growing pup. The pup receives milk from its mother, however, to within a short time of the birth of the next brother or sister. It is not known whether there is a definite weaning procedure but the probabilities are that there is merely a progressive substitution of adult food for the natural nourishment of all infantile mammals.

The sea lion pup dwells in no Utopia. Its best (and only) friend is its mother. If it becomes lost and makes timid advances to a strange cow, it will probably be seized by the back of the neck and thrown a dozen feet. If the end of its flight is another strange cow it will usually receive another boost. When a couple of bellicose bulls are endeavoring to commit mayhem on each other, such an insignificant object as a pup does not merit consideration, and one that delays departing from that vicinity with great promptness will in all probability be stepped on — with generally unpleasant consequences for the pup.



Photograph by Paul Bonnot

Both California and Steller sea lions occupy this Piedras Blancas rookery off the California coast — the Californias taking the territory on the right and the Stellers on the left. There seems to be little fighting between the two species even though they appear to be rather cramped for space.

Although the sea lion finds protection and food in its chosen element, the sea enacts its toll. Many rookeries are so exposed that big seas wash over them during the winter storms. Occasionally an off-season storm during the breeding season will drown great numbers of pups not yet able to swim. But the adults seem to have few natural enemies besides man. A large shark will catch a medium-sized sea lion, although the large bulls seem to pay scant attention to them. The savage killer whales are feared by even the largest bulls and when the high dorsal fins of the *Orcas* appear, all the sea lions in the vicinity take to the shore. Diseases are never very apparent, possibly because a sick or diseased animal does not survive long. The littoral and sublittoral zones of the ocean, the areas inhabited by the sea lions, are not conducive to the development of weaklings. A minor injury, the slightest loss of vitality, and the individual is marked for a prompt and usually violent demise.

Sea lions are very intelligent animals and not such slaves to habit as their relations, the fur

seals. Fur seals will return year after year to the rookery on which they were born, even in the face of persistent persecution. Sea lions will leave a rookery where they have been disturbed and sometimes move elsewhere for no apparent reason. They are easily trained to do a number of fairly complicated tricks. They are natural jugglers and will sometimes balance and play with a stone or piece of sea weed, evidently for amusement. The "trained seals" seen in zoos and circuses are nearly always California sea lion cows. Young Steller cows are occasionally exhibited but they are too large to be handled easily. The bulls of both species are also too large and, like many male animals, are too pugnacious to be managed. Nor are they as intelligent as the cows.

The present population of sea lions is only a small fraction of the great herds that once inhabited the Pacific coast. Vast numbers were killed a hundred years ago for the oil their blubber contained. As each animal contributed only a relatively small amount of oil, this type of exploitation was only profitable when large num-

bers of the animals were handled. The waste, of course, was tremendous, as only the oil was taken and the carcasses were left to rot. A few hides were sometimes utilized as glue stock.

During the last thirty or forty years the only commercial exploitation of the animals has been the activities of the trimming hunters. Trimmings are the genitals, whiskers and gall bladder of the full grown bulls. These were shipped to China where they found a ready market. The stiff bristle-like whiskers were used as cleaners for opium pipes, the gall bladders were incorporated in medical preparations and the genitals were dried, ground and sold as an aphrodisiac and rejuvenator of the aged. Considered merely a superstition based on the observed potency of the herd bulls, recent scientific studies of the origin and effects of hormones seem to indicate that perhaps the Chinese may have discovered a means by which impotent individuals could gratify their desire for sons.

In the matter of food, sea lions have a very catholic taste. They eat fish; sometimes commercially valuable ones, squid or any number of easily procured organisms. Periodically there are complaints by the fishing interests concerning their destructive propensities, but it has never been demonstrated that they do any extensive damage either to fish populations or to fishing

gear. The tonnage of fish landed at Pacific coast ports by commercial fishermen during the last few years is so enormous that there is some basis for the contention that the sea lions, although no more numerous than they have been for years, may be more obvious because of their efforts to obtain a living from the depleted stocks of fish. The commercial fishing interests advocate destroying them entirely, "as they have no commercial value." Animals have been exterminated in the past, intentionally or accidentally, with sometimes disastrous results. The sea lions may now be holding in check organisms of which we know little or nothing, on which it would be virtually impossible to impose man-made control.

The sea lions arouse the ire of a fisherman now and then by breaking his gear or stealing his fish and incur the displeasure of people who dislike any organism which they cannot profitably exploit. "If they're not good for anything, why not eliminate 'em?" is the attitude of these aggrieved individuals. But there are still a great many human beings who enjoy seeing an animal seeking "life, liberty and the pursuit of happiness" in the niche prepared for it by nature, and in the interests of these contemplative folk it is to be hoped that the commercial interests, fishing or otherwise, will not be able to force the extinction of one of our most interesting mammals.



Photograph by Dr. Wm. H. Bent

The slaughter of the sea lions is not something that happened long ago — it has been going on in recent years. These are carcasses on the San Benito rookery, within 5 years.

The POISONOUS SNAKES of the NEW WORLD. Part 2

By **CLIFFORD H. POPE**
*Fellow of the New York Zoological
Society; Curator of Reptiles of the
Chicago Natural History Museum.*

RECOGNITION AND DISTRIBUTION

Learning to recognize all the poisonous snakes of the New World is a task that few persons would need to undertake, but learning those of most localities is simple. Indeed, the greater part of North America, and part of South America, are free of dangerous kinds. It is obvious that much is to be gained by dividing the New World into regions and considering these separately. Many laymen do not grasp the significance of distribution; they think that an animal might suddenly decide to make a journey to almost any distant point. When I told a visitor to Chicago Natural History Museum that water moccasins are not found in the region of Chicago, he promptly replied, "I don't know of any law that would keep one from wandering up here if it felt like coming." He did not realize that inexorable natural laws do keep water moccasins far from Chicago. Even large soaring birds have their definite geographic ranges.

NORTH AMERICA NORTH OF THE UNITED STATES

The only dangerous snakes found beyond our northern boundary are rattlesnakes, and these are confined to limited parts of extreme southern Canada:

Ontario: The *MASSASAUGA* (Figure 12) occurs along the shores of Georgian Bay, Lake Huron, and Lake Erie but is rare or lacking in regions more than twenty miles from these bodies of water. It also is reported from the Lake Ontario shore as far east as Prince Edward County. Recently, a record for Cobalt, north of Lake

Nipissing, has turned up, but this calls for confirmation.

The *BANDED RATTLESNAKE* (Figure 6), although almost unknown in Canada, is occasionally met with in the narrow strip between the adjacent tips of Lake Ontario and Lake Erie, and may still exist on Point Pelee, the southern extremity of Ontario.

Alberta and Saskatchewan: The range of the *WESTERN RATTLESNAKE*, prairie subspecies (Figure 8), extends across the Montana boundary into the southeastern corner of Alberta and the adjoining corner of Saskatchewan.

British Columbia: The *PACIFIC RATTLESNAKE* (Figure 9), a far western subspecies of this same kind, occurs in southern British Columbia throughout the region approximately bounded by the Fraser and Thompson Rivers and Okanagan Lake.

These rattlesnakes are described in the following section.

THE UNITED STATES

Once the distribution of our poisonous snakes is understood, their identification becomes simple, but certain basic facts must be committed to memory. Every poisonous snake found north (and west) of our southeastern lowlands is either a rattlesnake or a copperhead (Figures 21, 22) and therefore has a facial pit and large movable fangs. The northern limits of these lowlands are fairly well indicated on a map by drawing a line from Cape Charles, Virginia, to the midpoint of the Alabama-Georgia boundary, thence to the

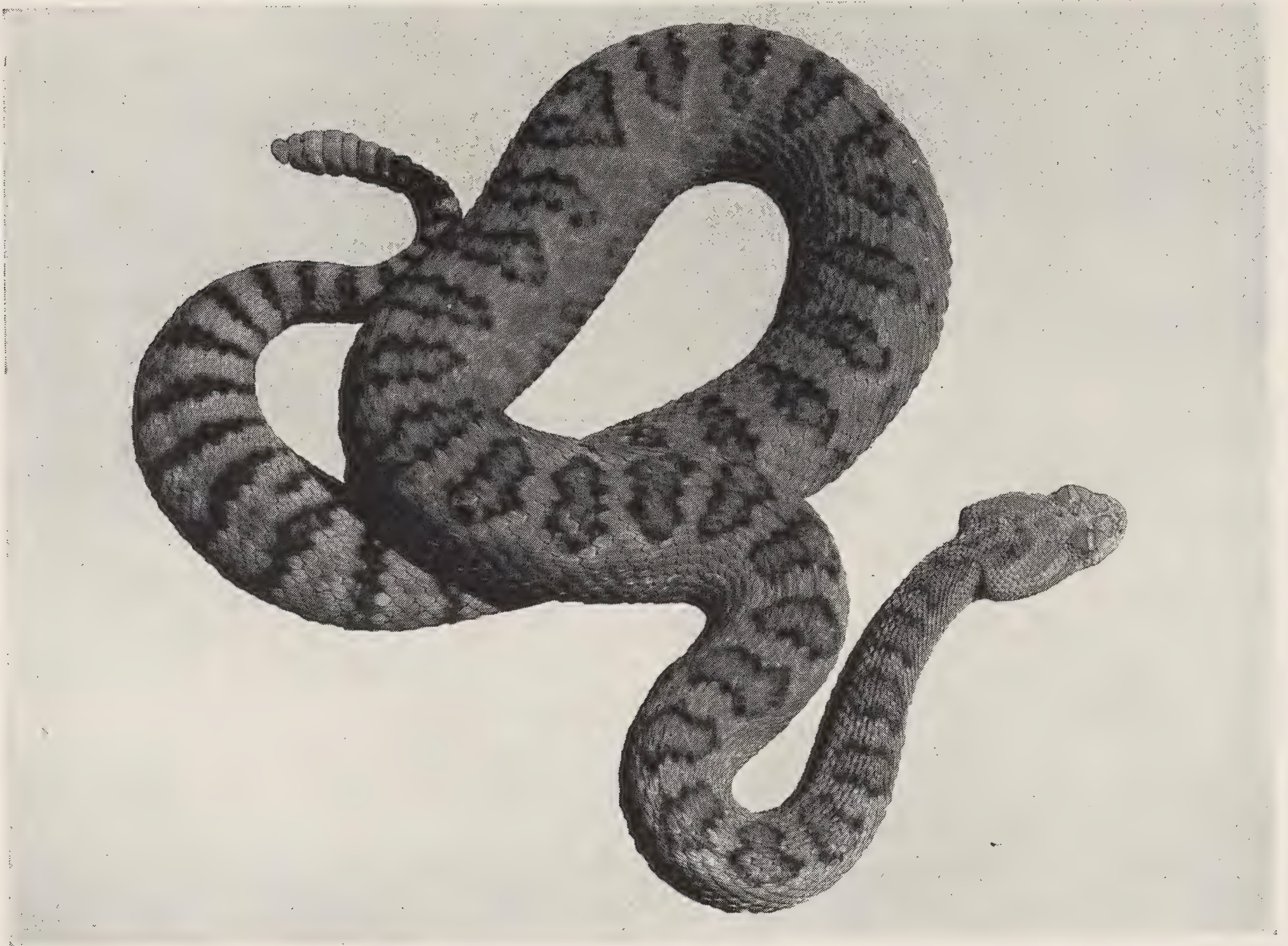


Fig. 10. Great Basin Rattlesnake, *Crotalus viridis lutosus*. Range: Great Basin of the United States. Average length: 38 inches. Highly dangerous.

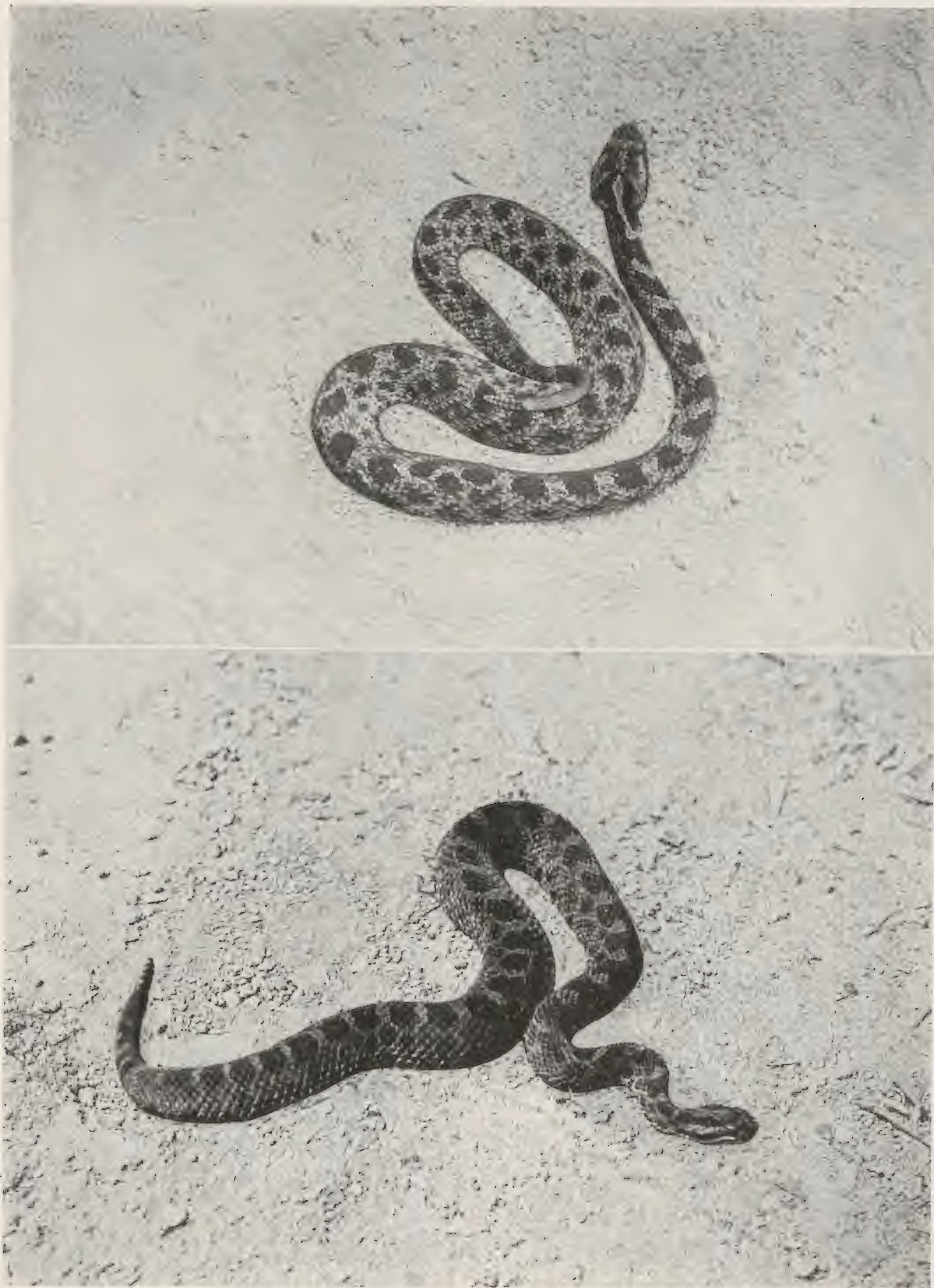
center of the southern third of Illinois, and from there to the junction of the Pecos and Rio Grande Rivers, Texas. The Arizona coral snake (Figure 26), an exceedingly rare species found at altitudes below 5,000 feet in southern Arizona, is the only exception, but this reptile is distinguished at once from other Arizona snakes by a black snout and brilliant pattern of black, red, and white bands that completely encircle the body. It is never more than eighteen inches long. A description of it is given below.

The layman's problem is further simplified by the limited distribution of the copperhead, for this reptile does not range north of a line connecting the northeastern tip of Massachusetts with Pittsburgh and Pittsburgh with the extreme southeastern corner of Nebraska; nor west of one connecting this corner with the upper Rio Grande in Texas and passing just southeast of New Mexico. Thus the recognition of a poisonous snake in that vast part of our country lying north and west of the copperhead's range presents no problem at all, for one has only to look for a rattle.

Certain extensive areas are entirely free of poisonous reptiles, notably all of Maine except possibly the country adjacent to the middle sector of the New Hampshire boundary; Long Island, New York; the upper peninsula of Michigan and the northern third of Wisconsin; all of Minnesota except the territory lying along the Mississippi south of St. Paul; the coastal strip of Oregon, and the lowlands of western Washington.

The recognition of a poisonous snake in the southeastern lowlands delimited above is complicated by the presence there of our common coral snake (Figures 1, 25), and an additional pit-viper, the water moccasin (Figure 23). Rattlers not found beyond the lowlands also occur but these are recognized at once by their rattle.

With these fundamentals of distribution securely in mind a resident of any given area can quickly determine the maximum number of kinds of poisonous snakes that might occur near his home. For example, anyone in upper Michigan, northern Wisconsin, or Minnesota north



Upper — Fig. 11. Southern Pigmy Rattlesnake, *Sistrurus miliarius*. Range: Southeastern United States. Average length: 19 or 20 inches. Bite not fatal to adults.

Lower — Fig. 12. Massasauga, *Sistrurus catenatus*. Range: North America from the region of the Great Lakes southwestward to the Rio Grande. Average length: 2 feet. Bite not fatal to adults.



Fig. 13. Black-tailed Rattlesnake, *Crotalus molossus*. Range: Arizona, southern New Mexico, southwestern Texas and the highlands of Mexico. Average length: 40 inches. Highly dangerous.

of the latitude of St. Paul would not have to consider the dangers of snake poisoning; one residing in southeastern Pennsylvania would have to recognize the copperhead (Figures 21, 22) and a rattlesnake; a Californian need concern himself only with the latter; a Mississippian with a rattler, the water moccasin, the copperhead, and a coral snake. The phrase "maximum number of kinds" is used advisedly because numerous areas of many square miles in the range of every snake do not happen to harbor individuals of the species. There are, for instance, extensive stretches of wild country in New Jersey entirely free of rattlesnakes even though these snakes are abundant to the north and south. Local museums and natural history societies are always glad to give specific information to the newcomer.

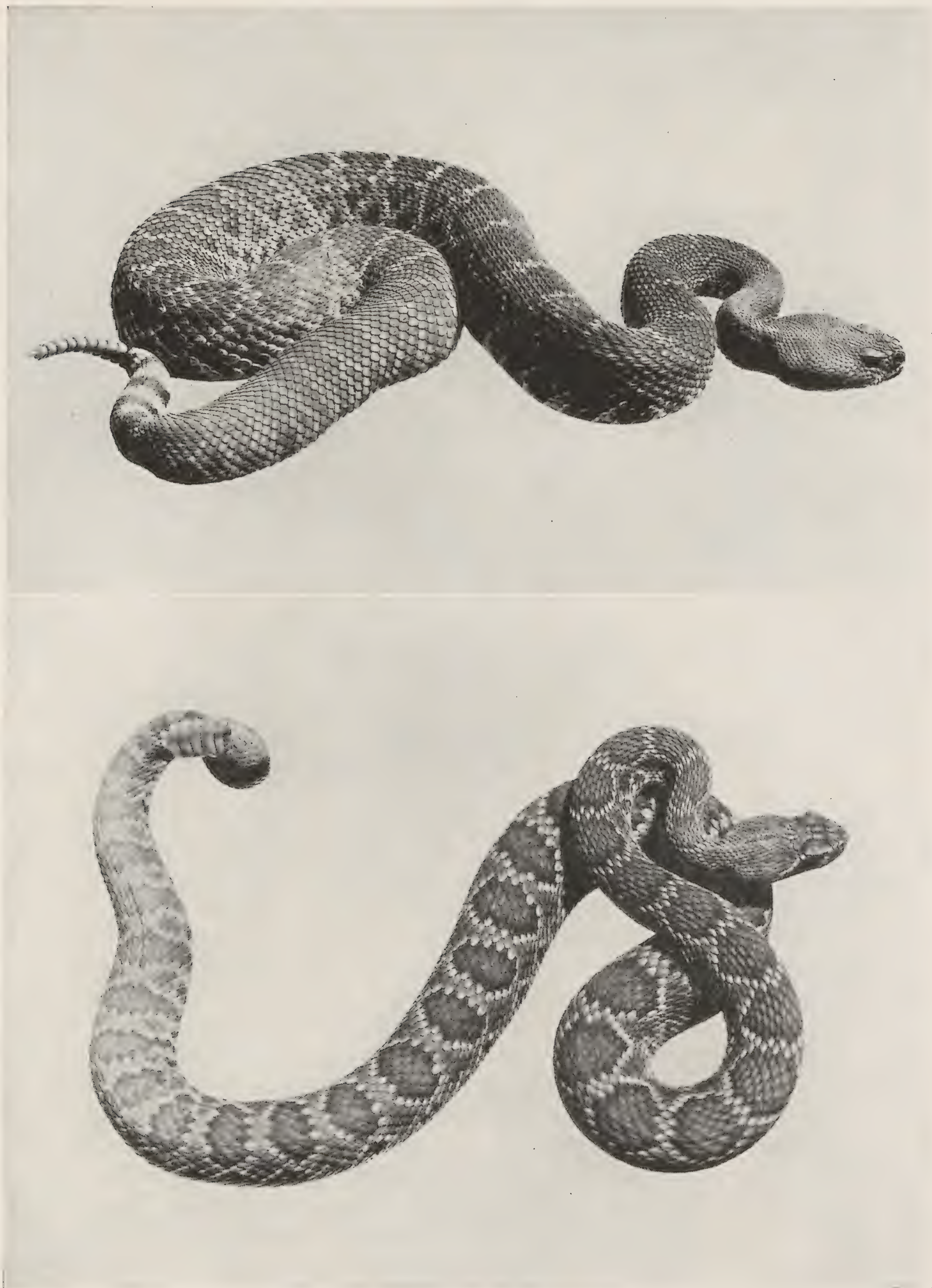
It is often stated that four "kinds" or "types" of poisonous snakes inhabit the United States, but such a statement is much like saying that

there are (among others) four kinds or types of human beings: a Chinese, an Englishman, an African, and a New Yorker. Actually, our dangerous snakes fall into two types, the coral snakes (Elapidae) and the pit-vipers (Crotalidae). The former include only two species, whereas the latter are technically divided into two groups with rattles and one lacking this convenient character. The members of this rattle-less group are the copperhead (Figures 21, 22) and water moccasin (Figure 23). These facts may be concisely stated thus:

Coral snakes (Elapidae): Two unrelated species

Pit-vipers (Crotalidae):

1. Two groups of rattlesnakes (*Crotalus* and *Sistrurus*)
2. A rattle-less group made up of the closely allied water moccasin and copperhead (*Agkistrodon*)



Upper — Fig. 14. Red Diamond Rattlesnake, *Crotalus ruber*. Range: Extreme southwestern California and most of lower California. Average length: 45 inches. Highly dangerous.

Lower — Fig. 15. Mohave Rattlesnake, *Crotalus scutulatus*. Range: Deserts of extreme southern Nevada and adjacent areas, especially western and southern Arizona, southward through the highlands of Mexico; Texas south of New Mexico. Average length: 37 inches. Highly dangerous.

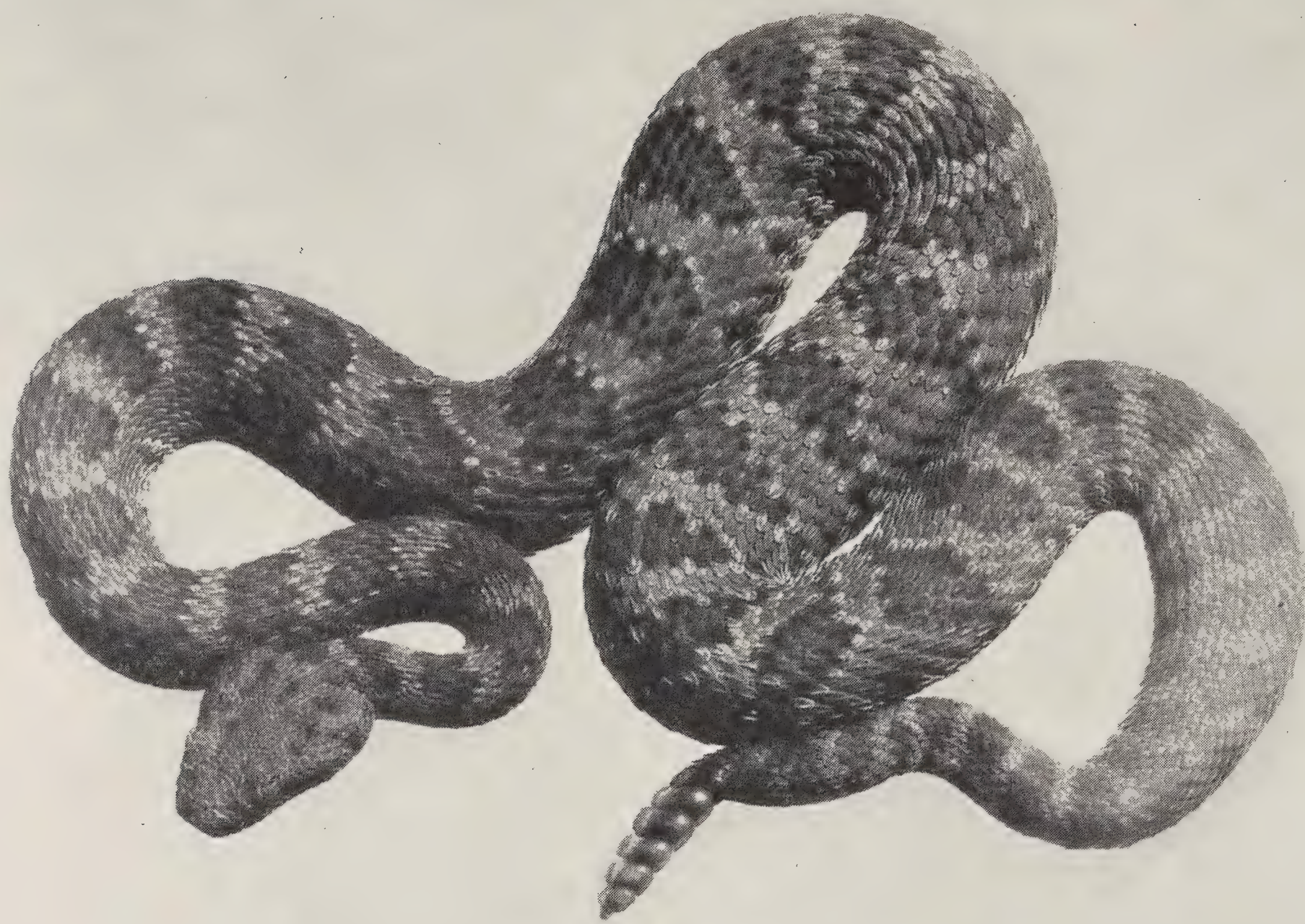


Fig. 16. Mitchell's Rattlesnake, *Crotalus mitchellii*. Range: Lower California northward through southern California to extreme southwestern Nevada; central and western Arizona. Average length: 33 inches. Highly dangerous.

In spite of their wide collective distribution, most of the species of rattlesnakes are confined to the region extending from central and northern Texas to the Pacific coast. Outside of this region one rarely if ever finds more than three kinds in a single area and one or two is the rule. Westward from Texas the number of kinds steadily increases until, in southern Arizona a climax is reached with no fewer than eleven species. Since identification of some of the southwestern rattlesnakes is extremely difficult, I shall not describe all of our fifteen species but only four large, well-known members of the major group (*Crotalus*), the two belonging to the minor one (*Sistrurus*), plus the two rattlesless pit-vipers of the United States. In short, ten of our nineteen poisonous species are briefly characterized below. This includes every one found in the country's eastern half and northwestern quarter, and it might be remarked, the few that reach Canada as well.

DIAMOND-BACK RATTLESNAKE, *Crotalus adamanteus* (Figure 4). This highly dangerous rep-

tile is not only the largest of all rattlesnakes but the heaviest poisonous snake known. The maximum length (excluding the rattle) is seven feet three inches, the average adult length just over five. It is confined to the coastal strip from Pamlico Sound, North Carolina, to the region in extreme eastern Louisiana north of Lake Pontchartrain; all of Florida is inhabited by it. The southern pigmy rattler (Figure 11) also occurs in the southeastern lowlands but is spotted and comparatively very small. The other large rattler of approximately the same region, the cane-brake rattlesnake, is banded (Figure 6) and does not inhabit peninsular Florida. The diamond-back's characteristic pattern of diamonds outlined in black and white amply distinguishes it; rural inhabitants of its range invariably recognize this reptile and give it a wide berth.

Palmetto flatwoods are the favorite haunt, but any low brush-covered country may be frequented. Although the diamond-back does not like swamps, it often lives in dry areas adjacent to water, and even swims occasionally. Some

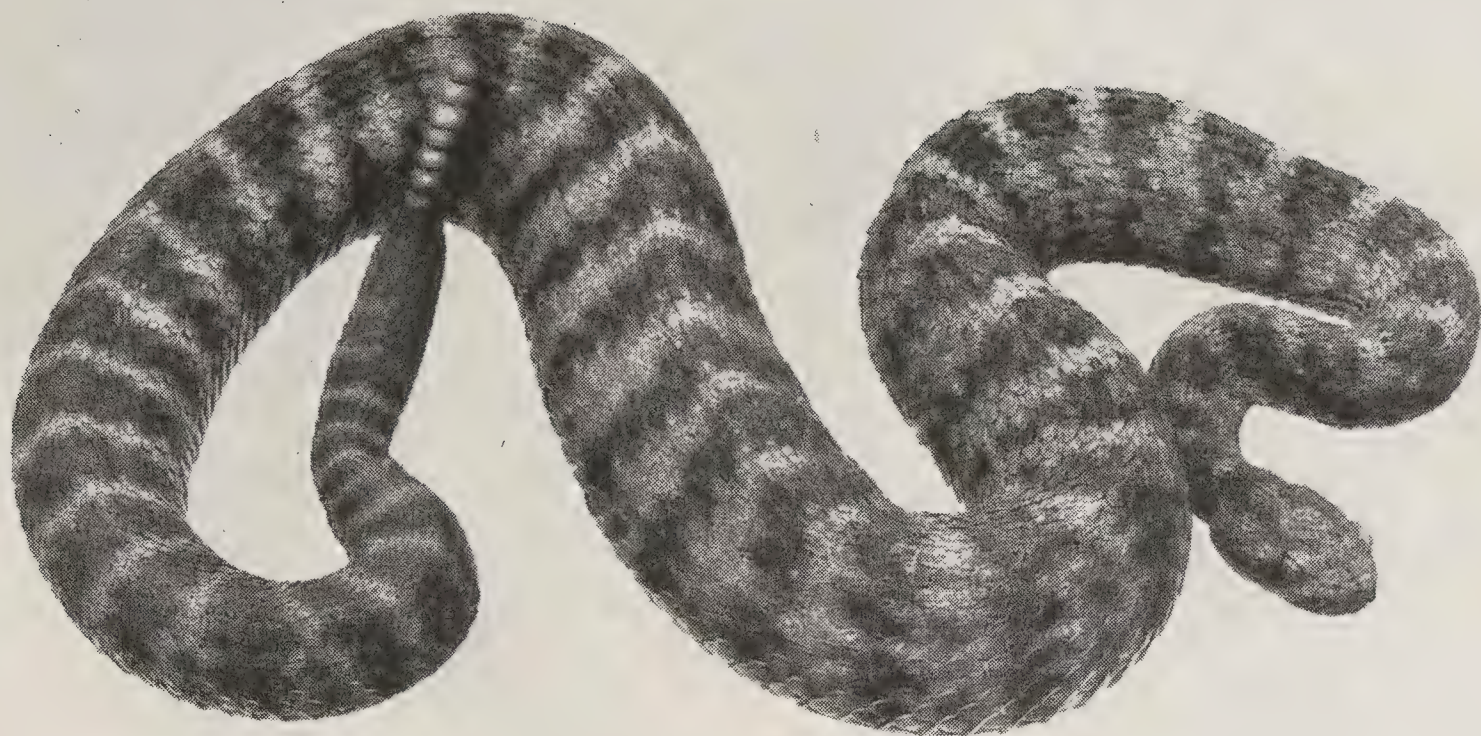


Fig. 17. Tiger Rattlesnake, *Crotalus tigris*. Range: A narrow strip of territory from the vicinity of Phoenix, Arizona, southward through the middle of Sonora, Mexico. Average length: 28 inches. Highly dangerous.

individuals rattle as soon as an intruder comes in sight, others refuse to do so until closely approached. Small mammals and birds are eaten, the former much the more frequently.

WESTERN DIAMOND-BACK RATTLESNAKE, *Crotalus atrox* (Figures 2, 5). There is little choice between this and the preceding species as a menace to man. Although the maximum recorded length of the western kind is two inches greater, its average length is five or six inches less; a more extensive distribution makes up for the smaller size. The range embraces the territory from central Missouri and Texas westward through the desert areas of southeastern California as far north as the southern tip of Nevada. The plains of extreme eastern Texas and the panhandle of that state are not inhabited, nor are the northernmost parts of Arizona and New Mexico. The range of this reptile, excepting central and eastern Texas, Oklahoma, and Missouri, is aptly styled the "rattlesnake belt" and in this belt identification of species becomes too difficult for the layman.

BANDED RATTLESNAKE, *Crotalus horridus* (Figures 6, 7). The distribution of this formidable reptile extends from the Atlantic coast (except peninsular Florida) to central Texas and eastern Kansas; in the northeast, it barely reaches Maine along the middle sector of its western boundary, and is found over at least the southern half of New Hampshire, most of Vermont and New York. West of Pennsylvania, its northern limits are in southern Ohio (excepting a colony at Catawba Cliffs of northern Ohio and on adjacent Lake Erie islands) and southern Indiana. From central and northwestern Illinois it follows the Mississippi valley northward to St. Paul, Minnesota. There are good records for the Baraboo Hills of southern Wisconsin.

Examination of thousands of specimens has shown that those from the southeastern lowlands are the larger and are different enough in color to be given a technical subspecific name (*atricaudatus*). This subspecies is usually known as the CANE-BRAKE RATTLESNAKE since it inhabits cane-brakes and other bottomlands. With maxi-

mum and average lengths of seventy-four and forty-eight inches, it ranks third in size among the rattlers of this country. The slightly smaller northern subspecies, often called the TIMBER RATTLESNAKE, frequents rugged, hilly country and even mountain forests. Because of its habit of hibernating in crevices of rocky ledges, it is associated with country in which such outcroppings are commonly seen. It is, nevertheless, encountered in wild upland river valleys far from rocky ledges, especially in the summer. In southern New Jersey, it even frequents flat, sparsely wooded pine barrens, and hibernates in wet sphagnum bogs.

Bold, black bands distinguish it from the other rattlesnakes of its range. The colors are rich and variable, some northern individuals being so black that the bands do not stand out (Figure 7). The most conspicuous distinction between the northern timber and the southern cane-brake rattlers lies in the intensity of the stripe behind the eye which is usually obscure in the timber, strong in the cane-brake rattlesnake.

This is not a vicious reptile but its size makes its bite highly dangerous, and the inexperienced

should approach it with extreme care. The food consists of a large percentage of small mammals, chiefly rodents, and a small percentage of birds.

WESTERN RATTLESNAKE, *Crotalus viridis* (Figures 8-10). A species highly variable in color and size occurs from the Pacific Ocean (except the coastal strip of Oregon and the lowlands of western Washington) eastward approximately to a line joining the centers of North Dakota and Texas. The variation is so great that six subspecific names have been given to the populations of as many areas. Since no other species occurs with this one over the whole northwestern quarter of the country, there is little need for descriptions of these subspecies. The three widely distributed ones, the prairie (Figure 8), the Great Basin (Figure 10), and the Pacific rattlesnakes (Figure 9), take their names from the regions they inhabit and attain approximately the same average size (three feet), the maximum length for any one of the three being five feet. The habitat varies with the different subspecies and so does the temperament. It is patent that any rattler attaining such dimensions must be classed as highly dangerous.



Fig. 18. Rock Rattlesnake, *Crotalus lepidus*. Range: Texas west of longitude 98° and south of latitude 31°; southwestern New Mexico and extreme southeastern Arizona; higher parts of the Mexican highlands southward to Jalisco. Average length: 22 inches. Highly dangerous.



Upper — Fig. 19. Horned Rattlesnake, *Crotalus cerastes*. The projecting scales above the eye that give rise to the term "horned" are clearly shown here. The peculiar form of locomotion is responsible for its other name, "Sidewinder."

Lower — Fig. 20. Horned Rattlesnake, *Crotalus cerastes*. Range: Extreme southwestern Utah westward to the Sierra Nevadas in southern California and southward into northeastern Lower California and northwestern Sonora, Mexico. Average length: 2 feet. Highly dangerous.

MASSASAUGA, *Sistrurus catenatus* (Figure 12). This is one of the three species that comprise the smaller group of rattlesnakes usually known as "pigmy" or "ground rattlers." These snakes carry a potent venom but their small size keeps them from being nearly as dangerous to life as are the larger rattlers. In other words, one of them would be approximately as dangerous as another rattler of equal size.

The massasauga attains a maximum length of three feet, an average of two feet. Its range extends from Ohio and the lower peninsula of Michigan southwestward to the Rio Grande but does not include any of Arkansas except the northwestern tip, nor that part of Texas lying east of the lower valley of the Brazos River. There is evidence of its occurrence in central and western New York and in Pennsylvania from the Allegheny River valley westward; also in the extreme southeastern corner of Arizona. Its boldly spotted pattern and small size readily distinguish it from the banded rattlesnake (Figure 6), the only other snake of the northeastern half of the massasauga's range having a rattle; in the southwest, it enters the "rattlesnake belt" and is easily confused with other species.

The massasauga frequents bogs, swamps, and similar poorly drained areas; during the summer it may move to adjoining drier situations. In the Chippewa language, massasauga means "great river-mouth." This fact is evidence that part of

the original habitat was the swampy river-mouths of the Chippewa country. The food consists of mice, frogs, and, occasionally, snakes. In the northern states where the cooler climate keeps human feet and legs well covered the chance of the massasauga's short fangs reaching their goal is slight, but the barefoot southern boy or girl might be seriously poisoned by one of these snakes or its relative about to be considered.

SOUTHERN PIGMY RATTLESNAKE, *Sistrurus miliarius* (Figure 11). The average length of this, one of the smallest of rattlesnakes, is only nineteen or twenty inches, the maximum twenty-five and a half. It is boldly spotted somewhat like the massasauga.

The range includes all of South Carolina; the lowlands of North Carolina, Georgia, Florida, Alabama, and southwestern Tennessee. There are records only for southern Mississippi, but west of the Mississippi River, the distribution embraces Louisiana, central and eastern Texas, the southeastern half of Oklahoma, all of Arkansas, and southern Missouri. East of the Texas-Louisiana and Arkansas-Oklahoma borders no other small, spotted rattlesnakes occur, the two diamond-backs (Figures 2, 4, 5) and the banded rattlesnake (Figure 6) being amply distinct. Further west, the range somewhat overlaps those of the massasauga (Figure 12) and the western rattler (Figure 8), introducing complications of identification.

Will Sharks Attack Human Beings? Yes!

For many years there have been arguments about sharks: Will they, or will they not, attack human beings? The standard argument of the anti-shark-bites-man school has usually been that the attacker was not a shark, but some other fish, such as a barracuda.

In the "Journal of the American Medical Association" of July 22, 1944, the question seems to have been settled; at least one shark did attack — and kill — one man. The "Journal" reports the case of a sailor who went overboard on September 23, 1943, in a shallow cove about 75 feet off the north shore of Rey Island, Gulf of Panama, and was quickly attacked by a shark 6 or 7 feet long. No refuse had been dumped into the cove, and no sharks were seen before the sailor went over the side to inspect the ship's propeller.

The young man was horribly mangled by the bites and died seven hours later. The tips of two teeth were found among his injuries and were identified by John T. Nichols of the American Museum of Natural History as the teeth of the so-called man-eater shark, *Carcharodon carcharias*; in this identification Dr. C. M. Breder, Jr., at that time director of the New York Aquarium, concurred.

How Baby Kangaroos Get Into the Pouch

On November 16, 1940, a gray kangaroo was born in the Clifton Zoological Gardens at Bristol, England, and the actual birth and the progress of the inch-long baby toward the maternal pouch were watched. Through the years there has been so much speculation about kangaroo births, and the method by which the baby reaches the pouch where its development continues, that it was a piece of extraordinary good fortune that an observer was on hand to give evidence about the Bristol event.

In the latest number of the *Proceedings of the Zoological Society of London* received here, Dr. L. Harrison Matthews of the University of Bristol not only reports on the birth of the gray kangaroo but surveys previously published accounts of marsupial births.¹

"Until recent years," he writes, "it was generally believed that the new-born marsupial, immediately after birth, was deposited in the maternal pouch by the mother, and that this deposition was effected by the dam using manus or lips, or by her propulsion or guidance of her offspring along the surface of her abdomen by means of her tongue. Since 1920, however, various observations have been published, showing that the new-born marsupial crawls into the pouch, receiving from its parent but a limited or indirect aid."

At the Clifton Zoological Gardens, as soon as the baby had been born the mother leaned forward and began licking her abdominal fur in a two-inch long path for the baby.

"When the latter had gained the top of this

patch, another wet patch was prepared in continuity with the first, the process being repeated until the young one had climbed above the level of the marsupium, into which it then crawled. Between the spells of licking, the dam leaned well backward, keeping her anterior abdominal wall almost level.

"The infant was about an inch long; its hind limbs were crossed and flexed, and covered ventrally by the tail. Its eyes were closed, its mouth roundly open. It crawled by its forelimbs only, clawing its way by a sideways and downward thrust of these members. Soon after its arrival in the marsupium, it climbed to the rim thereof and fell out. It was replaced by the observer, and several hours later was found to be still unattached to the nipple. Several days later it had vanished. The dam was known to be an indifferent parent, and had previously lost partly-reared progeny."

After reviewing accounts of marsupial births published in recent years, Dr. Matthews states:

"These accounts of parturition in marsupials agree in stating that the neonatal marsupial crawls into the marsupium by its own efforts, and is not transferred thereto by the mother. The dam, indeed, appears indifferent to the fate of her offspring, of which she takes small notice. Should her young one miss the pouch, she makes no attempt to direct it thither; should it fall to the ground, she does not retrieve it. All observers agree that the sole assistance rendered by the female to the new-born, is, apart from the assumption of a particular posture, the preparation, by licking, of a moist track through the fur of the maternal abdominal wall from cloaca to marsupium."

¹ Parturition in the Kangaroo. By L. Harrison Matthews, Department of Zoology, University of Bristol, *P.Z.S.*, Vol. 113 (1944), Series A, No. 10, pp. 117-120.

FISH May Be Poisonous, Too

By ROSS F. NIGRELLI

PEOPLE expect snakes to be poisonous. The few species that actually are venomous have been so well advertised that the whole tribe suffers suspicion. But fish, except in limited circles, are supposed to be entirely harmless. Nothing could be further from the facts — some fish are quite as venomous and as deadly as any snake.

It might seem that, since most of us do not go hiking or picnicking in the open ocean or among coral ledges, the poison fishes of the seas do not present much of a problem. Nevertheless, they do; commercial fishermen, who throw back about 7 out of 10 kinds of fish they catch, have to be well aware of the kinds of creatures it is safe to touch with the bare hands. Some rather important problems have been arising, too, in connection with the government's efforts to increase the food supply by popularizing species of fish not generally utilized. And the Army and the Navy have been very careful, in their instructions to service men how to find food if they are cast away, to point out the dangers that may exist in some brightly colored, appetizing-looking tropical fishes.

Soon after the beginning of the war the National Research Council undertook to find out which of the species ordinarily found in the nets of commercial fishermen, and usually thrown out, could be utilized as food. It has long been known that some, such as the sharks, grayfish (dog sharks or dogfish) and skates, could be eaten. As for some others, including the blowfishes (puffers, porcupinefish and rabbitfish), sea robins, rays and the like, there was some doubt about their edibility, for long tradition indicated that they were poisonous.

In our local waters, a fish that is caught in abundance from April until October is the Atlantic puffer, *Sphaeroides maculatus*. Epicureans

Food requirements of wartime, and the experience of service men, have made us aware of the venomous creatures of the sea.

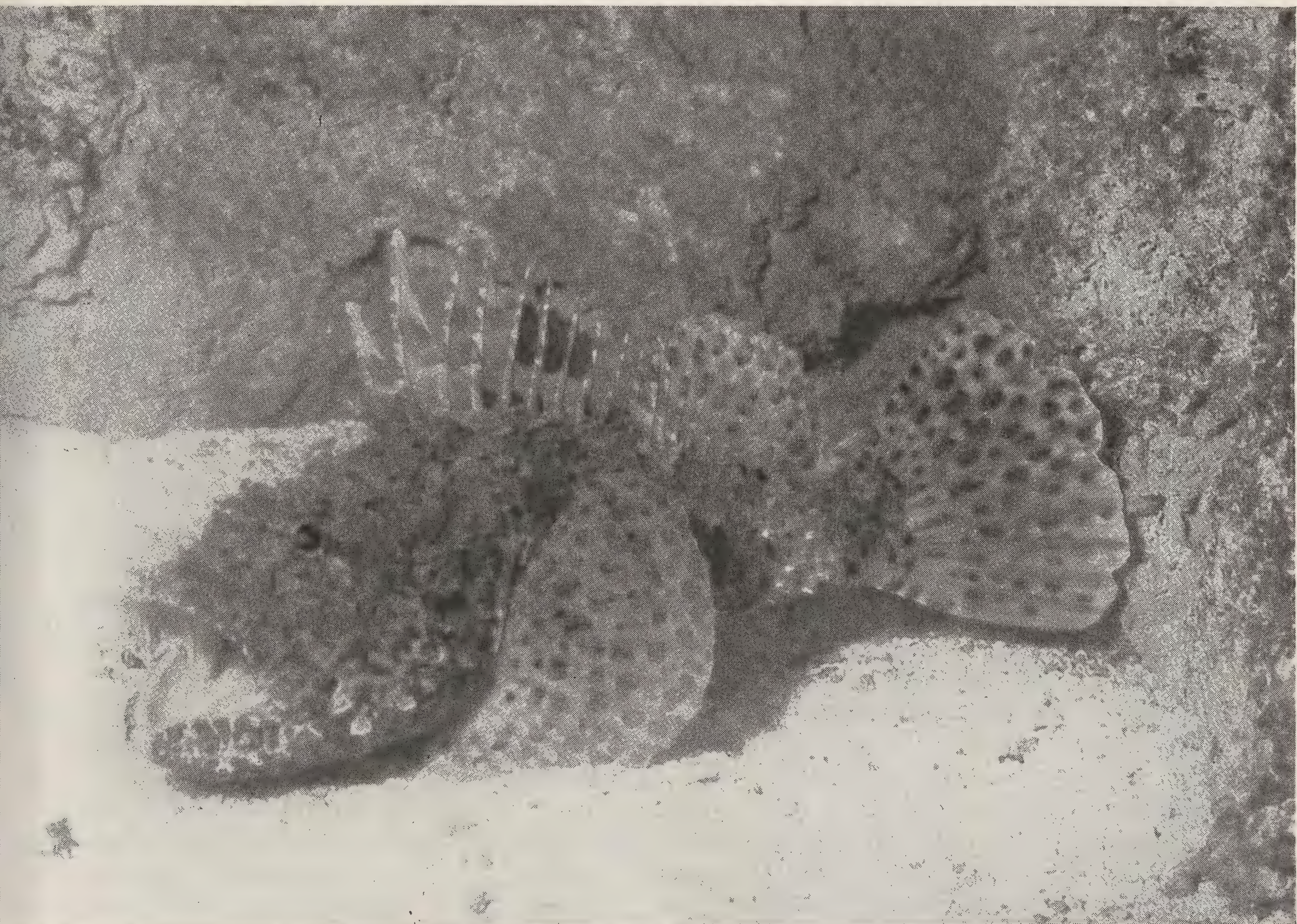
— the few that have tried it — say it is a real delicacy.

But the puffer has a bad reputation, because a long time ago it was said to be poisonous. Is there any real evidence for that tradition?

W. H. Yudkin of the Bingham Oceanographic Laboratory has been looking into the matter and has summarized the case of puffer, or tetrodon, poisoning, especially among the species of puffers found in other parts of the world. It seems that the viscera (especially the ovaries and liver) of the puffers are highly toxic and from them has been isolated a poison called "tetrodotoxin." Furthermore, it has been found that puffers caught in the late summer or early autumn are not poisonous — or at any rate that their toxic effects are greatly diminished. This decline in toxicity is apparently related to the condition of the ovaries, which at this part of the year are in a "spent" condition. The chemical nature of tetrodotoxin is not yet clearly understood, although its paralyzing effect on the nervous system is well known.

However, it is important to point out that there is no evidence that the *flesh* of any of the puffers, either the Atlantic species found around here or the members of the family in other parts of the world, is poisonous, and that only the viscera are suspect. From my own experience I can report that puffer meat is perfectly wholesome and in fact quite as tasty as others have stated it to be.

But there are many species of poisonous fishes that employ actual venom, and many cases of



A particularly ugly customer to handle is the scorpion fish, various species of which are found in the warm seas of the world. It secretes a poison under the skin of each of the dorsal spines. This specimen is the Madeira scorpion fish, *Sebastes maderensis*, often exhibited at the Aquarium.

poisoning have been reported. The *Bulletin* of the U. S. Army Medical Department as recently as last spring reported on fish poisoning among natives of the Marshall Islands — an area much in the daily news recently. In that Pacific area there are three groups that need to be watched: 1. those which poison by biting or stinging; 2. fish having definitely poisonous flesh; 3. fish having doubtfully poisonous flesh. In the first group are listed such wellknown venomous creatures as the morays, stonefish, toadfish, weeverfish, zebrafish, and so on. To this list might be added stingrays, scorpionfishes from other oceans of the world, and certain catfishes from North America.

Obviously one would do well to keep away from the morays in the Marshall Islands or elsewhere, for the Army publication remarks that they "have hollow teeth through which venom is injected into the wound. The venom is hemo-

lytic and large doses produce almost instantaneous death; smaller doses cause rapid, embarrassed respiration, violent cramps, and convulsions."

Dr. Charles M. Breder, Jr., former director of the New York Aquarium, pointed out in his "Field Book of Marine Fishes of the Atlantic Coast" that the Atlantic morays also reach large size and are greatly feared by fishermen. "Brought aboard a small skiff, it is an ugly customer" and can snip off a finger with ease. Nevertheless, the flesh of the morays is eaten with avidity in certain parts of the world — after throwing away the head which contains the poison apparatus, presumably.

Many species of scorpionfish, found in warm seas, secrete poison under the skin of each dorsal spine, the glands forming little bags full of a milky juice. The most fantastic — and one of the most dangerous — of this group is the beautiful black-and-white-striped zebrafish, or lion-

fish, of the tropical Pacific. Its pectoral fins are remarkably long and the needle-like spines are greatly to be dreaded. Specimens used to be exhibited with regularity at the Aquarium in Battery Park and fortunately no member of the staff ever had any serious encounters with the spines. However, a collector who brought fish to the Aquarium once accidentally stuck his hand on one of the spines and suffered terrific pain and swelling for many hours.

One scorpionfish that is dreaded by natives and fishermen is the black vohu, or nohu (*Emmydrichtys vulcanus*), that lives among lumps of lava along the shores of Tahiti and other Polynesian islands. Its spines are dangerous stinging instruments. So are the spines of the monstrous-looking scorpionfishes of the genus *Synanceia* — short, thickset, irregularly-formed fishes which can eject a highly toxic venom. Yet the flesh of all these poisonous fishes is perfectly good and sells readily in the native markets.

The most elaborate and perfect system of poison organs known among fishes are found in certain South American toadfishes. Two spines on the first dorsal fin and other spines on the gill coverings are the dangerous ones. They are like the hollow fangs of a poisonous snake, perforated at the base and at the tip. Since no definite glands are associated with the spines it is assumed that the poisonous fluid is secreted by the mucous membrane. The great ichthyologist Gunther, in his "Introduction to the Study of Fishes," pointed out that "the slightest pressure of the finger at the base of the spine caused the poison to jet a foot or more from the opening of the spine."

The toadfish or oysterfish (*Opsanus tau*), commonly found along our coast, has no poison spines but is reputedly poisonous nevertheless and persons have been made violently ill by eating it. The fish gives off tremendous amounts of mucous and the flesh has a disagreeable odor and taste.

The European weevers (*Trachinus draco* and

T. vipera) are unpleasant members of the rogue's gallery of the sea through their habit of partly burying themselves in the sand in shallow water. Bathers sometimes step on their projecting poison-injecting spines, and get violent pains as a result. Nevertheless they are good eating and considerable numbers of the larger species, *T. draco*, used to be brought to the Paris market.

Fishermen the world over fear the stingrays, so-called because of the serrated spine they bear at the base of the whip-like tail. The tail itself is not particularly dangerous; the spine causes the trouble apparently through the surface mucous it introduces into the wound. To make matters worse, the spine is loosely set and sometimes pulls away and remains in the victim.

Even our fresh water streams are not free of poisonous fishes and many a New York state fisherman has reason to remember the diminutive catfishes known as Mad Toms. Their pectoral spines are equipped with poison sacs that produce very painful but not dangerous punctures.

As if it were not enough to find so many fish that are actively poisonous, it appears that individual wrasses and parrotfishes of the tropics, which ordinarily are quite non-poisonous, sometimes become toxic because they have been feeding on poisonous mussels, sea cucumbers and sea anemones.

The picture of fish life outside the range of the familiar, tried-and-true market fishes, is not as lethal as it might seem, however, for it is highly probable that at least some of the fishes that have a bad reputation in various parts of the world are not really poisonous, and that cases of human poisoning attributed to them are due actually to bacterial decomposition.

It would seem that in truth there are "as good fish in the sea as ever were caught" — for food — and that gourmets the world over might well continue with their experiments on new market fishes. As with snakes, the bad ones are really few and far between.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

TWO YOUNG AGOUTIS

Of all the mammals of tropical America, two groups are so common that few zoos, however unpretending, are without them. These are the Agoutis and the Coatis. Coatis are lively, interesting and vicious, so that they never fail to amuse visitors. But Agoutis are quiet and harmless, and look so much like out-sized guinea-pigs that they too often are passed by. Their soft coloring and graceful movements are appreciated only by the discriminating.

Common as Agoutis are in collections, they are not easily bred and in all the years our Zoological Park has exhibited them, less than half a dozen births have been recorded. Consequently, when a female Central American Agouti (*Dasyprocta punctata*) presented us with two lively youngsters, we were both pleased and proud. Agoutis are usually born in pairs, and come into the world with eyes open and legs prepared to move with amazing agility. The little animals are a great attraction to our visitors in the Small Mammal House, whom they constantly astound by their infantile abilities in running and leaping.—LEE S. CRANDALL.

46 BABY RATTLESNAKES

An extraordinarily large litter of Western Diamond-back Rattlesnakes was born in the Reptile House on September 8-9. A medium-sized female produced 46 young, of which 26 were alive.

Although there seem to be few records of the size of litters in *Crotalus atrox*, the average is certainly far fewer than 46. In their "Field Book of Snakes," Schmidt & Davis cite the average as "about 10," but state that occasionally "20 or more" are born at one time. Other herpetologists mention litters of 4 to 23.

The first young appeared about 3 o'clock on the afternoon of September 8 and only three had been born when the Reptile House staff departed for the night at 6:30 P.M. The following morn-

ing at 7:30 o'clock, 45 young snakes were on the floor of the cage, 26 alive and 19 dead. One other stillborn baby was in process of birth, but was not entirely dropped until mid-afternoon.

There was a noticeable change in the temperament of the female after the birth of the babies. Ever since she arrived from Texas in July, she had been quiet and tractable. The opening of the rear door of her cage never caused her to rattle and she could only be induced by vigorous poking with a snakestick to bestir herself and assume a defensive posture.

The morning after the birth of the babies, however, she was almost continually in a fighting coil and her rattle was in constant motion. Even the presence of visitors at the front of her cage caused her to face the glass and keep up a steady rattle. She did not seem to show any curiosity about or interest in the babies, most of which crawled into a distant corner of the cage and coiled up together. Occasionally an isolated baby would "rattle" its juvenile button in tune with its mother.—W. BRIDGES.

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since the last issue of this magazine are the following:

Mrs. Arthur E. Lamb	<i>Annual</i>
	Mrs. Anna N. Wanek
	<i>Fellow</i>
Dr. John T. Zimmer	

A RARE BABY CRANE

In all the history of the Zoological Park, up to 1944, only two young cranes, both of the same species, have been reared here. These two were White-necks, one in 1916, the other in 1943. Cranes of several other species — Demoiselles, Paradise and Sandhills — have nested here, but always unsuccessfully. These negative results are in accord with almost world-wide experience and lend weight to the impression that cranes are difficult to breed in captivity. Actually, this thought is only a half-truth, for once a young



Sticking close to its mother, the baby wattled crane explored every inch of its big corral. This photograph was taken a few days after the baby was hatched and was obtained under difficulties, for the male bird savagely resented interference and the photographer had to work from a stepladder.

crane has been hatched, its parents may be trusted to rear it, almost to a certainty. The real difficulties all come before the hatching of the young.

In the first place, cranes are finicky as to mates and the purchase of a male and a female by no means insures a breeding pair. Once this difficulty has been overcome, it is necessary to provide a secluded area, as large as possible, with enough grass and other cover to insure a supply of the earthworms, grubs and insects with which the parents feed their offspring. If it is hard to find a breeding pair of any kind of cranes, it is harder still to find an area, especially in a public park, where they may be expected to breed successfully.

The Wattled Crane, of eastern and southern Africa, is one of the very rarest of the group. Our first example was received in 1937 and we were pleased enough to find him a fine, tame young bird, in perfect condition. We never

hoped to see another one but in 1940 a second bird arrived from Africa. This one was noticeably smaller than the first and it was fairly evident that we now had a pair.

The supposed male had become savage with maturity, as cranes are likely to do, and we kept the two in adjoining enclosures, to give them an opportunity to become acquainted. When the gate in the partition fence was finally left open, a battle immediately followed and the birds were separated with no little risk to life and limb. Actually, the better part of a year passed before we finally got them to live together in peace.

In the spring of 1943 the birds were liberated in the African Plains "Annex," an area of several acres, in company with assorted Zebras, Aoudads, Hartebeests, etc. Early in June two eggs were laid at the edge of a rainwater lagoon and our hopes were high. However, they were soon ended by a period of drought which left

the nest high and dry, so that the eggs were soon trampled under numerous hooves.

By the spring of 1944 the male crane had become so savage that we considered him unsafe in a mixed collection and the birds were placed by themselves in an adjoining corral measuring perhaps one hundred yards square. Here they were almost completely isolated from public view, but there was compensation in the likelihood of breeding. This worked out as we had hoped and on June 20 a single egg was laid. This was incubated closely and on July 26 a wobbly, reddish-brown chick emerged, establishing an incubation period of thirty-six days.

During their early lives, young cranes are fed entirely by the parents and during this period will pick up nothing for themselves. There was an abundance of natural food in the now-overgrown enclosure and after the first few days, the chick began to come to the feeding place with the old birds, to receive choice morsels of raw fish, horse-meat and game food. At the age of two weeks the young bird was seen to feed for

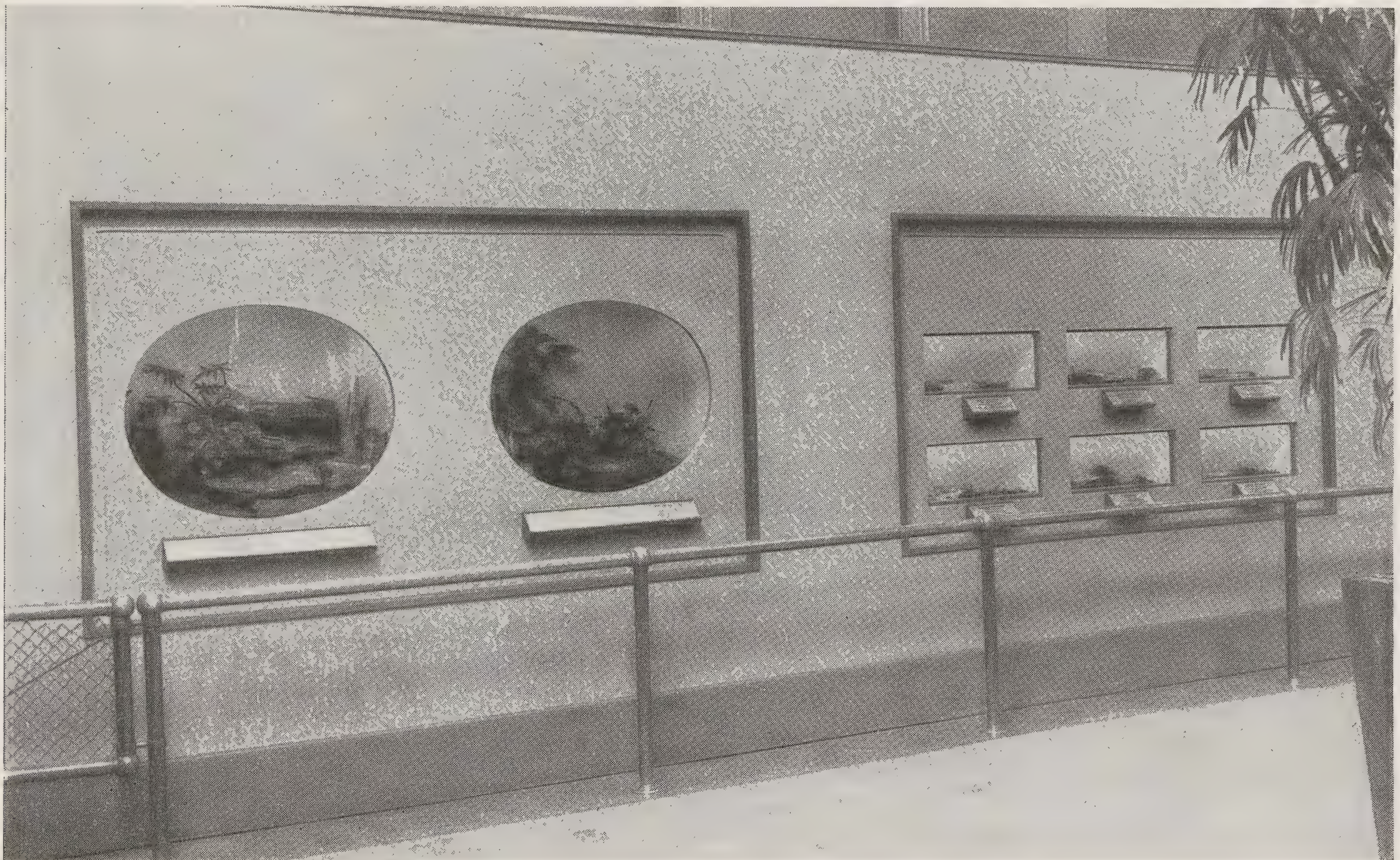
itself and from that time on, it has grown with amazing rapidity.

If this youngster is safely reared, as there is every reason to believe it will be, it appears, at least as far as published records go, that it will be the first of this rare species to be bred in captivity. The only previous record involving the species is that of a hybrid between a Wattled Crane and a "Canadian," reared in England in 1911.—LEE S. CRANDALL.

PUBLICATIONS OF INTEREST

GUIDE TO HIGHER AQUARIUM ANIMALS. By Edward T. Boardman. Cranbrook Institute of Science, Bloomfield Hills, Michigan. 107 pp., 58 illus. 1944. \$2.00.

While this book is by no means perfect in its field and suffers somewhat from the smallness of its scope in relation to the size of the field, it is an extremely desirable step forward on a path unfortunately but badly marked. Increasing numbers of people try to keep local aquatic animals of one sort or another and are unable to find guides except, usually, highly technical and



"Utterly painless" is the way one snake-fearing visitor described a tour of the Reptile House after its exhibits were modernized this summer. These panels, setting off large cages decorated with plants and rocks, replace a series of small, bare box cages that used to line the wall.



Looking across the barnyard at the Farm-in-the-Zoo toward the pasture and the “little red barn” which houses the major part of the poultry exhibit. For most visitors the barnyard is probably the center of interest, for here the calves gambol and the poultry keeps up its cheerful noise.

specialized works whose very appearance scares off the novice.

Dr. Boardman’s “Guide,” although specifically directed at the aquatic fauna of the midwest, has sufficient range to be quite useful to the amateur naturalist in these parts, covering all the aquatic vertebrate groups and giving specific instructions for keeping many of the animals encountered hereabouts.

We regret that Dr. Boardman seems to approve, by indirection or omission, certain fallacies of long standing about the maintenance of an aquarium, but this is of minor importance compared with the basic value of the book as a whole.—C. W. COATES.

SHRUBS OF MICHIGAN. By Cecil Billington. Cranbrook Institute of Science, Bulletin No. 20, 1943. 249 pp., 161 figs. \$2.50.

This book fulfills the purposes of the author “to awaken and stimulate an interest in the native flora and create a desire to know more about it,” and at the same time gives a rather accurate picture of the distribution of the shrubs of Michigan as recorded in the various herbaria.

The distribution maps, indicating location by counties, are very good and the drawings of all the species included in the book are quite helpful in recognition of species.

Beginners will appreciate the explanation of the generic names and the glossary of the Latin specific terms used in the book. A key to the genera of Michigan shrubs is included.—N. M.

ANIMAL KINGDOM



BULLETIN, PUBLISHED BY
NEW YORK ZOOLOGICAL SOCIETY

AVING THE TRUMPETER SWAN, *by J. Delacour* • APE COLONY IN FLORIDA, *by Henry W. Henshaw* • POISONOUS SNAKES OF THE NEW WORLD, III, *by Clifford H. Pope* • News and Notes

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York 20, N. Y.

PRESIDENT

Fairfield Osborn

FIRST VICE-PRESIDENT

Alfred Ely

SECOND VICE-PRESIDENT

Laurance S. Rockefeller

SECRETARY

Harold J. O'Connell

TREASURER

Cornelius R. Agnew

EXECUTIVE COMMITTEE

Fairfield Osborn, *Chairman*

Cornelius R. Agnew
Alfred Ely
Marshall Field

De Forest Grant
Warren Kinney

William De Forest Manice
David H. McAlpin

Robert Moses
Harold J. O'Connell
Laurance S. Rockefeller

BOARD OF TRUSTEES

Class of 1945

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely

Marshall Field
Childs Frick
Archer M. Huntington

David H. McAlpin
John H. H. Phipps

Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Class of 1946

George Gordon Battle
George C. Clark
F. Trubee Davison

Jay Downer
Robert I. Gannon

Robert Gordon McKay
Fairfield Osborn

Laurance S. Rockefeller
John M. Schiff
Frederic C. Walcott

Class of 1947

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez

De Forest Grant
Eugene Holman
Warren Kinney

Henry R. Luce
William De Forest Manice
Harold J. O'Connell

Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Ex-officio, The City of New York

The Mayor, Hon. Fiorello H. LaGuardia

Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

John Tee-Van *Executive Secretary*

Jean Delacour *Technical Adviser*

Edward Kearney *Manager, Facilities Dept.*

William Bridges *Editor & Curator, Publications*

Claude W. Leister *Curator, Education*

Sam Dunton *Photographer*

Sanford Miles *Comptroller*

Quentin Melling Schubert, *Superintendent, Construction and Maintenance*

ZOOLOGICAL PARK

Lee S. Crandall . *General Curator & Curator of Birds*

Claude W. Leister *Associate, Mammals*

Leonard J. Goss *Veterinarian*

John Tee-Van *Associate, Reptiles*

Grace Davall *Assistant to General Curator*

W. Reid Blair *Director Emeritus*

William Beebe *Honorary Curator, Birds*

AQUARIUM

Christopher W. Coates *Curator and Aquarist*

C. M. Breder, Jr. . *Research Associate in Ichthyology*

Ross F. Nigrelli *Pathologist*

George M. Smith . *Research Associate in Pathology*

Myron Gordon *Assistant Curator*

Homer W. Smith . *Research Associate in Physiology*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*

Jocelyn Crane *Research Zoologist*

Henry Fleming *Entomologist*

George Swanson *Staff Artist*

Associates

William K. Gregory
John Tee-Van

Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

Vol. XLVII

DECEMBER 1, 1944

No. 6

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York 20, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York 60, N. Y. Title registered with United States Patent Office.

Subscription, \$1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

A Place for the Natural Scientists

Some day political cabinets, forums for the planning of "brave new worlds" and other ways-and-means committees for human welfare, had better include in their number some natural scientists, more specifically a biologist, a zoologist, and an ecologist. Man and the lesser creatures of this earth have a good deal in common. Take the matter of "territorial rights." This problem is as old as the hills, has recurred all through man's history and exists in its most acute form at this very moment. In animal life, individual, family and even social-group disputes over the ownership of territories are indulged in — by gorillas and groundhogs, eagles and hummingbirds, and even little fishes.

There is nothing "unnatural" about all manner of living things fighting for the right to live in their own localities. In this respect the principal difference between human beings and the other animals is that the methods used by man to solve his territorial-rights problems seem somehow more illogical and desperate than those employed by most animal societies. What patterns have the latter followed? What answers have the instincts and lesser intelligences of animals evolved? Can man help himself by becoming more informed concerning them? In turn many various aspects come to mind — for example, among higher mammals the predators, or habitual killers, comprise probably less than 2% of the total populations in any given territory or continental area. Again, in the case of higher mammals combat within a species itself is "forbidden," except for the protection of family rights. The family is the basis of virtually all the more highly developed animal societies. What significance have such facts and countless others? Yes — it might be quite a good idea to make a place for the natural scientists.

Fairfield Osborn

IN THIS ISSUE

Portrait of a Chimpanzee	Sam Dunton	COVER
Government Refuges Are Saving the Trumpeter Swan	Jean Delacour	131
The Ape Colony in Florida	Henry W. Nissen	137
The Poisonous Snakes of the New World. Part 3	Clifford H. Pope	143
Behind the Scenes: News and Notes		153
Index to Vol. XLVII		154

DEC 7 '44



A. V. Hull Photo—U. S. Fish and Wildlife Service

In a little isle of tule reeds, a Trumpeter Swan incubates her eggs in the Red Rock Lakes National Wildlife Refuge in Montana.

Government Refuges Are SAVING THE TRUMPETER SWAN

By
JEAN DELACOUR

THE GLORIFIED GEESE with long necks and short legs, which we call swans, have long stimulated man's interest and fancy, ever since the ancient Greeks made one an incarnation of Zeus, the King of the Gods. The largest of the seven existing species is a North American bird, the Trumpeter Swan. Unfortunately, it also is the only one which is threatened with extinction today.

The two swans of the southern hemisphere, the Australian Black and the South American Black-necked, are comparatively small and, of course, very distinct. So is the popular, semi-domesticated Mute Swan, which in a truly wild state is still found in eastern Europe and central Asia. The four remaining northern birds, however, are very similar in shape, color and habits, and are all so closely related that when more is known about their breeding distribution, they may be found to constitute only two species.

All are pure white birds. Unlike the Mute and Black Swans, they cannot raise their wings in anger, and they lack the black frontal knob of the former. They have a resounding, bugle-like voice, varying in intensity but of a similar general quality.

It is an interesting but by no means a unique fact that each of the two northern continental regions possesses two very similar forms of swans, differing mostly in size. The two Eurasian swans, the Whooper and the Bewick's, have a large yellow patch on the bill, in the former covering the basal two-thirds, in the latter only one-third, roughly speaking. The smallest of the American swans, the Whistler, usually shows a small yellow spot on the side of the upper mandible, near the forehead; but sometimes it has a pure

Ten years ago fewer than 60 birds survived in the United States; to-day the population has increased greatly.

black bill, which is the constant privilege of the Trumpeter. The latter bird is a good deal larger, as a rule, with a longer neck. But between a small Trumpeter and a large Whistler there are few obvious differences. The only safe characteristic in doubtful cases is the voice, deeper in the Trumpeter, shriller in the Whistler. If a doubtful bird is dissected, no mistake is possible, for the windpipe is dissimilar in the Trumpeter and in the Whistler; in the Trumpeter, it makes a vertical loop over a lump in the breast bone and emerges through a separate opening, which is lacking in the Whistler.

Trumpeters may attain a weight of 36 pounds, adult males averaging 30 pounds. Whistlers very rarely weigh 20 pounds, although individual variations are great. The average length of the wing of the five white swans will give some idea of their relative sizes:

Trumpeter	26.18 inches
Whooper	23.77 "
Mute	23.22 "
Whistler	21.65 "
Bewicks	20.70 "

Compared with their three highly migratory closest relatives, Trumpeters are rather sedentary birds, much like the Mute. They appear to travel only in search of food and open water. They breed as far south as they can and winter as far north as possible, while the Whoopers, Whistlers and Bewicks nest in the far North and accomplish long and regular winter journeys to the South.

These life habits have almost proved fatal to



K. F. Roahen Photo—U. S. Fish and Wildlife Service

This Red Rock Lakes area is typical of the region now being set aside as a refuge for the Trumpeter Swan. Two big and shallow lakes—actually little more than marshes—contain plenty of tule reeds for shelter and nesting material. Here, under protection, it is expected that the bird will thrive.

the Trumpeters. In former days they ranged all over central and western North America, from British Columbia to California, east to Manitoba, Minnesota, Iowa, Missouri, Arkansas and Colorado. At an earlier period they may have been even more widespread, as Dr. Alexander Wetmore of the Smithsonian Institution has identified bones from various deposits, from Maryland to the Mississippi Valley, and also from Florida in the Pleistocene remains. It seems, however, that most of the last century's records of Trumpeter Swans from the coast of California and on the Gulf of Mexico are inaccurate. They were probably based on black-billed Whistlers. In those days, all swans possessing a wholly black bill were called Trumpeters.

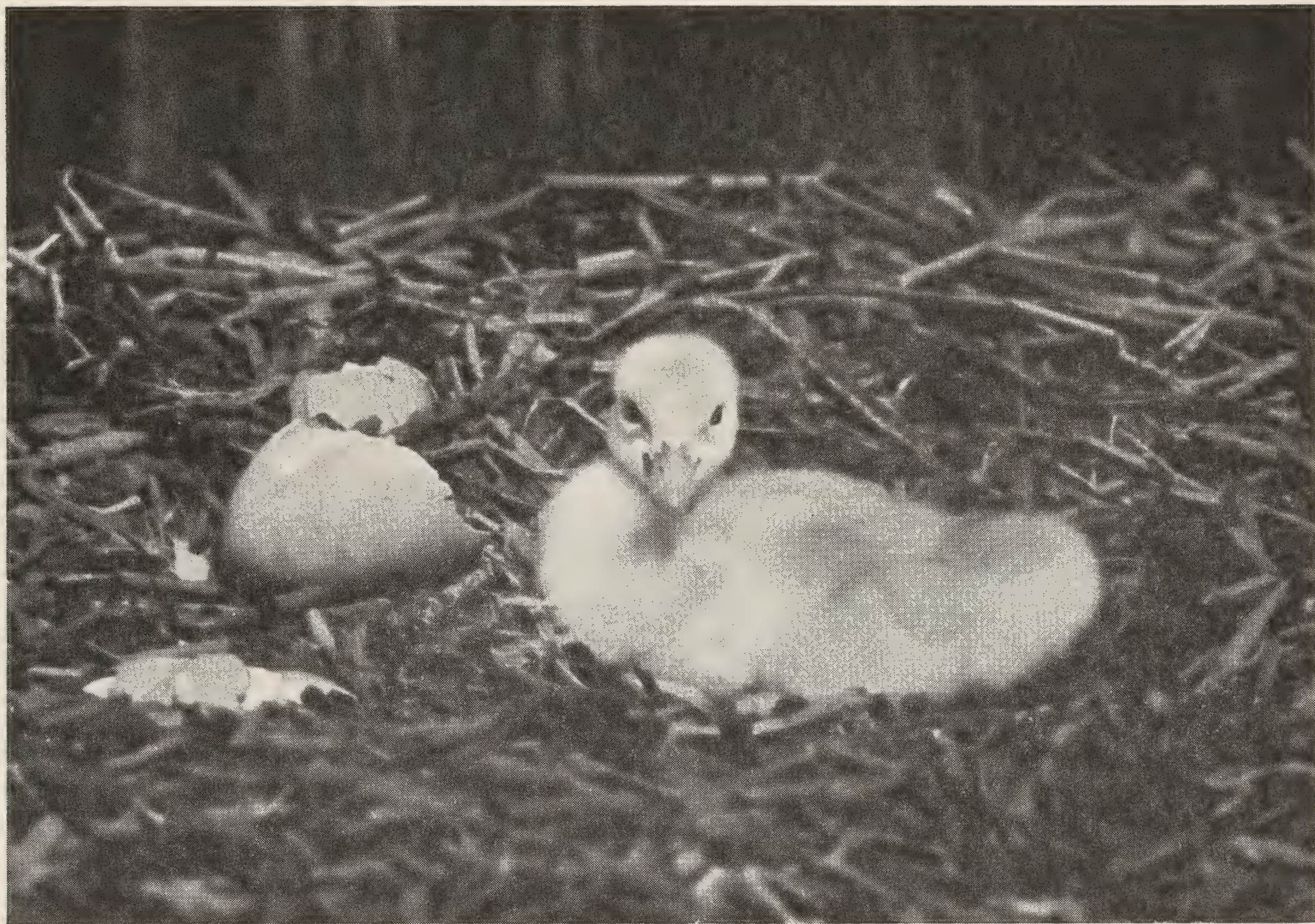
Because of their more or less sedentary habits, Trumpeters used to nest and to winter well within areas which became settled by man when the country was opened up. Consequently they were slaughtered quickly and easily, the more so since they usually fly low, within the gunner's

reach. Whistling Swans still abound. They are much more wary, fly high and have so far enjoyed a good deal of security in their far northern breeding grounds.

Today, the Trumpeter is making its last stand in the wilds of British Columbia, in the protected areas of the Red Rock Lake Refuge (Montana), the Yellowstone National Park (Wyoming), and a few nearby localities. It has disappeared from all other parts of its former range.

About ten years ago, only a few hundred birds were supposed to remain in British Columbia, while in the United States fewer than 60 survived. Today the situation is already better, thanks to the establishment of the Red Rock Lake Refuge in 1935. The Trumpeter population has increased greatly in that part of Montana, and the Yellowstone colony has been holding its own.

A census made during the summer of 1944 indicates 169 adult and 62 young swans in the Red Rock Lake area, and 44 adult and 11 young



A. V. Hull Photo—U. S. Fish and Wildlife Service

A newly-hatched cygnet of the Trumpeter Swan in one of the Montana refuges. Oddly enough, the cygnets of these swans seem never to have been described scientifically, and Mr. Delacour has undertaken the preparation of notes on the young birds, as a result of his recent visits to the refuges.

in the Yellowstone. Although it remains difficult to count Canadian birds accurately, the estimated number of Trumpeters now in the Dominion is about 500.

In Montana and Wyoming, however, the increase has been slowed up or even stopped during recent years. Evidently the Red Rock Lakes are reaching their population limits. Several attempts to transplant birds in other refuges, at Jackson, Wyoming, and at Malheur Lake, Oregon, have been only partially successful, the majority of the released birds disappearing promptly. Out of ten birds introduced into the Elk Refuge at Jackson, only three have stayed since 1938 and for the first time a nest was built this year. Three eggs were laid, two cygnets hatched and one reared.

Evidently something more had to be done to save the species, to make certain that its existence can never again be threatened, whatever might happen in its present dangerously restricted strongholds. The fate of such an outstandingly

interesting bird as the Trumpeter Swan has long occupied the anxious attention of naturalists in North America, and elsewhere. Emergency conservation measures, including strict protection and the establishment of sanctuaries, as mentioned before, have resulted. But they are hardly sufficient. A new line of action has therefore recently been proposed and adopted, thanks mostly to the initiative and energy of Mrs. C. N. Edge, Chairman of the Emergency Conservation Committee. From the satisfactory breeding results obtained in Europe over a long period (since 1873), notably by the late F. E. Blaauw in Holland, Mrs. Edge came to the conviction that the most practical way of increasing the number of Trumpeters was to multiply them under direct control. In March, 1943, she made a study of the question with the help of a veteran game breeder, Mr. R. Follett, and they both had several consultations with me on the subject. Needless to say, I was at once in complete agreement with them. It has long been my belief that a

large number of species of mammals and birds can be saved from extinction only through artificial propagation. Practically all the ruminants and many other mammals, the great majority of wildfowl, gamebirds, pigeons, parrakeets, a number of waders, particularly the cranes, and some other birds, can and should be maintained by the establishment in captivity, under suitable conditions and care, of an adequate breeding stock.

All the creatures which normally live in tropical or temperate countries, now densely inhabited by man, or on the way to be settled, are destined to disappear. Even the wildernesses of the Arctic and the Antarctic, of desert and mountains, long inviolate sanctuaries of many species, are now being easily penetrated. Protective regulations and the setting apart of refuges and national parks are, in many cases, an effective remedy. But too often they cannot be extensive enough to guarantee the future of many species, especially of birds which require vaster boundaries than the areas which can be possibly spared.

Sad as it is to conservationists, the fact cannot be ignored that the incessant increase of the human population of the earth is bound to restrict further and further the habitat of wild animals, whose presence is incompatible with cultivation and exploitation. Ignorance of such truths has caused the disappearance of many fine forms of life the world over which easily could have been preserved in a captive state. To speak of North America only, it would not have been difficult to keep in confinement a suitable stock of Passenger Pigeons, Carolina Parrakeets, Heath Hens and Labrador Ducks. It will be the eternal regret of nature lovers that this was not done in time. On the other hand, the American Bison and the Elk are now safe under management which, in fact, is a form of captivity on very large ranges.

The project for the eventual establishment on various government refuges of an adequate number of captive breeding pairs of Trumpeter Swans was approved by Dr. Ira Gabrielson, Director of the Fish and Wildlife Service. The American



F. W. Ouradnik Photo—U. S. Fish and Wildlife Service

The Malheur National Wildlife Refuge in Oregon is similar in physical characteristics to the Red Rock Lakes refuges. This particular area is now being used to settle young swans, and will be fenced.

Wildlife Institute, the American Committee for Wildlife Protection, the International Committee for Bird Preservation, the National Audubon Society, and the New York Zoological Society joined the Emergency Conservation Committee in recommending a captive-breeding project and in promising their support.

In the course of the last thirty years I have happened to gain some experience with the management of wildfowl, as about 90% of the existing wild species were kept and raised in

in the company of Mr. Leo L. Laythe, the Regional Director. We were able to outline a general plan for action, and this was carried out during our subsequent visit in August and September.

The first idea had been to remove eggs from some of the swans' nests at Red Rock Lakes, to hatch them and to rear the cygnets under domestic fowls. But on the occasion of our first visit, we found that the Trumpeters were easily rearing their broods, which were out of the reach



Miles D. Pirnie Photo

The experiment of keeping Trumpeter Swans has been tried several times at the W. K. Kellogg Bird Sanctuary in Michigan, but with indifferent success. These three swans in the Kellogg Sanctuary were reared in Holland by the late F. E. Blaauw, who started breeding them as early as 1873.

large numbers on my waters at Clères, in Normandy. A more complete collection had never been gathered before in the world. For that reason the Fish and Wildlife Service authorities were good enough to ask me to act as an advisor and to supervise the project. I was therefore appointed a collaborator of the Service, the New York Zoological Society graciously consenting to lend my time to the Government when the necessity arises.

In such a capacity, I visited the Red Rock Lakes (Montana), Jackson (Wyoming), and Malheur Lake (Oregon) Refuges in May, 1944,

of predators on the numerous small islands of the shallow lakes, and that it was simpler to catch the wild-raised cygnets before they could fly.

A clutch of five eggs, however, had been taken before our arrival at Red Rock Lakes, and was already being incubated under bantam hens. These hens proved to be too small to cover them properly. In spite of this unfortunate start, two eggs were duly hatched and easily reared by Dr. Ward Sharp, the manager of the refuge, on a very simple diet of milk curd, chicken feed and green food. We had hopes that the robbed

pair of swans would nest again, but they refused to do so, and the only supposed advantage of taking eggs rather than catching cygnets was thus denied. On August 30 and 31 and on September 1, we caught 20 cygnets on the Red Rock Lakes. The operation was not difficult as all the broods had been carefully located in advance by Dr. Sharp, and it was easy to run down the birds in flat bottom boats. The captured cygnets joined the two hand-reared ones in a small enclosure, and at once they started feeding, showing no fear whatever.

The following days, all the young swans were transported to the Malheur Lake Refuge in eastern Oregon. The 700-mile journey was made by truck, with specially-built crates. After a day's rest in a small pen, the cygnets were pinioned and released in a cage enclosure, including a 3-acre pond fed by springs and free from ice the year 'round, which had been especially built for them. They will remain there until they reach their third year, when they will be separated in pairs and settled in breeding pens to be installed for them at the Malheur Lake and other government refuges offering adequate conditions of climate and protection, as well as permanent open water. We plan to catch other cygnets during the next few seasons until we have reached the total of breeding pairs we pro-

pose to establish. Their offspring will eventually be used to resettle favorable waters in the former range of the species.

Trumpeter Swans undoubtedly respond well to management and captivity if kept in suitable climate and surroundings. The hot summers of the eastern parts of the United States do not seem to agree with them and results in the New York Zoological Park and in the Kellogg Sanctuary in Michigan never were encouraging. In western Europe, however, they have done well. As early as 1873 broods were reared in the London Zoo, and in 1882 at the Jardin des Plantes in Paris, in very small pens under the continual disturbance of a large public. Ever since they bred regularly in several private parks. They figured in the Clères collection and the late F. E. Blaauw used to rear some every year in Holland.

The cooler parts of western North America, their native land, will no doubt prove more favorable still. It seems, therefore, fairly certain that a good number of breeding Trumpeter Swans will soon be established in captivity in the United States under public supervision. In my opinion this is the only safe method of insuring permanently the fate of this remarkable species, the largest of all wildfowl. The time was indeed running short for action.



R. S. Bach Photo

These four-weeks-old cygnets in the Red Rock Lakes Refuge were reared by a hen during the past summer, and are the first Trumpeter Swan cygnets to be brought up in captivity in the United States.

At Orange Park Dr. Robert M. Yerkes has brought to fulfillment his plans for a psychobiological laboratory for the study of man's nearest relatives.



The Yerkes Laboratories of Primate Biology are housed in a series of large and modern buildings at Orange Park, Florida. This is known as the Laboratory Building.

The APE COLONY in FLORIDA

By HENRY W. NISSEN

Yerkes Laboratories of Primate Biology

NEARLY THIRTY YEARS AGO a young Harvard professor published an article in the journal *Science*, in which he urged the establishment of a laboratory for the study of monkeys and apes. Most of our fundamental knowledge in biology and medicine, he pointed out, had come through the study of animals. But because of their relative scarcity and high cost, because practical information regarding care and breeding was lacking, and probably because of sheer inertia, the monkeys and apes had been neglected as materials of biological research. By virtue of their great similarity to man, Robert Mearns Yerkes argued, these subhuman primates should be more valuable than any lower form of animal life in helping to solve the problems of human biology. What observation and experiment showed to be true of an ape would obviously be more nearly applicable to man than a discovery made on a grossly divergent form of life such as a frog, guinea pig or cat. In the study of intelligent behavior and its underlying brain mechanisms, especially, the anthropoids should prove uniquely important; in respect to behavior, as well as in

appearance, no other animals remind us so much of ourselves.

World War I temporarily diverted scientific enterprise towards the solution of urgent practical problems. But in 1924 Yale University provided Dr. Yerkes with facilities for testing out the feasibility and value of using apes as laboratory animals. Four young chimpanzees were purchased and were housed in a converted barn-garage on Prospect Street in New Haven. The experiment was a success, and five years later, in 1930, a laboratory especially designed for primate research was established at Orange Park, Florida. Through gifts, by purchase, and by breeding, the colony grew rapidly, reaching a maximum of fifty-one chimpanzees a few years ago. Thus, after long years of planning, and at the cost of much effort in promoting and demonstrating the practicability of his vision, Dr. Yerkes brought to fulfillment his plans for a psychobiological laboratory in which man's nearest relatives, the monkeys and apes, provided the materials of research.

The Orange Park laboratory was set up both as a research center and as a breeding colony to provide apes for its own purposes and for the



Stages in the growth of a chimpanzee—Alpha, the mother, and Alf, her baby, immediately after birth.

needs of other research institutions. The few chimpanzees previously available to scientists were imported from Africa; their history was quite unknown, their ages could only be guessed at, and more often than not they were diseased and had received injuries incident to capture. The nucleus of the Florida colony was provided by the original four animals brought down from New Haven, by sixteen chimpanzees procured from Africa through the good offices of the Pasteur Institute, and by a gift of twelve apes from the collection of Mrs. Rosalie Abreu of Havana, Cuba. Further specimens were procured subsequently by gift or purchase, but for the past ten years the colony has been largely self-perpetuating.

In the first thirteen years of its existence more than fifty chimpanzees were born at the Florida laboratories, 27 males and 27 females. The first of these, Alpha, is already a mother of three youngsters whose grandfather (Alpha's father) is still a member of the colony. Ordinarily chimpanzees do not mature until about the age of twelve years, but Alpha was precocious and bore her first offspring when she was only nine years old. The gestation period of the chimpanzee is approximately eight calendar months. Labor is usually brief and apparently easy, although a few cases of prolonged and difficult labor have been observed. The chimpanzee mother is not always

skillful in taking care of her first-born; she may hold the infant upside down or even allow it to be suspended by the umbilical cord. But she profits by this first experience, and her later-born youngsters are invariably well taken care of. The chimpanzee mother nurses her baby for over a year, often for the first two years of life. Rarely is she so modern as to allow the youngster any supplementary food before it is 8 or 10 months old. During the first year and a half mother and child are practically never separated, night or



The baby, Alf, at the age of two days.

day; the baby usually clings to the mother's abdomen and may later ride on her back. If the father ape has been caged with the female right through the period of pregnancy, he participates in the care and education of the offspring—increasingly so as the baby gets older. Observation made by the writer in Africa indicate that the male parent takes over responsibility in times of stress or difficulty: when a high tree is to be climbed, when a quick get-away from danger becomes necessary, or when the jump from one limb to the next is more than the female with a baby clinging to her can manage.

Some five years ago a special study of early chimpanzee development was begun.¹ In order to have these animals available for frequent testing and measurement, the babies were separated

¹ Supported in part by the Samuel S. Fels Fund.

from their mothers a few hours after birth. They were raised under carefully controlled and standardized conditions, bottle fed, and diapered. These youngsters, sixteen of them so far, are weighed and examined for dental development every day, X-rayed and measured every month; records of temperature, respiration, pulse and activity are taken at frequent intervals; every few weeks they are tested for behavioral development in a series of situations standardized for the human infant by Dr. Arnold Gesell of Yale University; a day-to-day record is kept of illnesses and of all their responses to social and physical stimuli. Probably few human infants have had such complete records kept of their early development as these baby chimps.

It appears that the quantity and quality of our

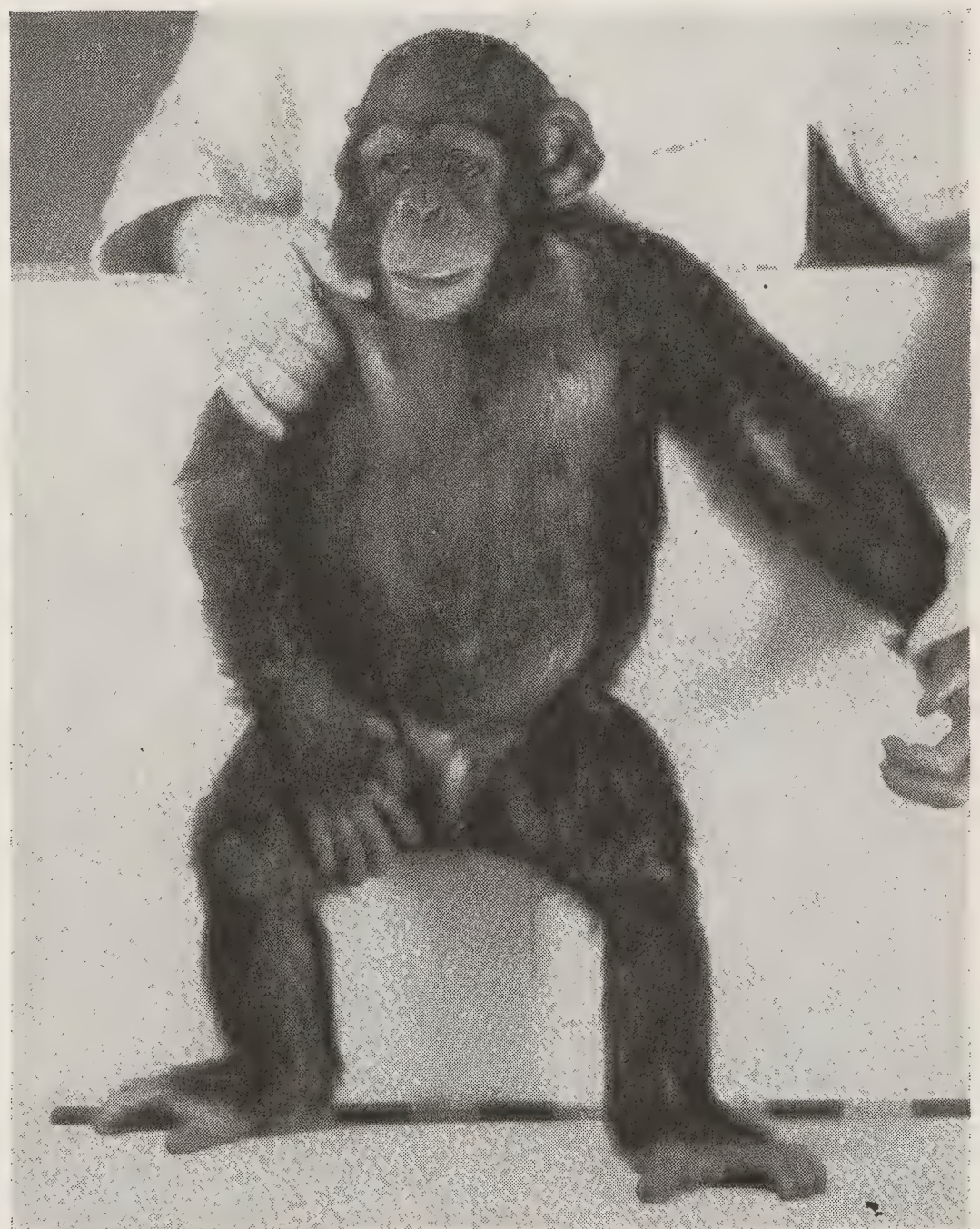


Alf has now reached his first birthday.

formulae and feeding schedule are more adequate than the food provided by the chimpanzee mother. At any rate, the nursery infant increases its birth weight of four pounds to about sixteen pounds during the first year of life, whereas the mother-raised baby weighs only 10 pounds at the end of its first year. Youngsters captured in the African bush are much farther advanced in dentition than in weight and size when compared to our laboratory-reared infants. Although the time of tooth-eruption is not an accurate index of age, these facts indicate that the wild chimpanzee

grows more slowly than do the chimpanzee natives of Florida.

Most of the nursery infants become habitual thumb suckers, whereas youngsters raised by their own mothers almost never suck their thumbs. There are probably two factors operative to produce this difference. The hands of the mother-reared baby are constantly occupied in holding on to the skin and hair of the parent; if it were to indulge in thumb sucking the security of its position would be jeopardized. The youngster in the crib does not have such a constant and vital occupation for its hands. The second factor is concerned with the circumstances that the nursery baby has to wait for the three hours prescribed by laboratory routine from one feeding to the next. If it becomes hungry in the meantime, the limbs thrash about and in the course of these movements a finger or toe may accidentally get into the mouth. Sucking responses are ready to be set off, and so the habit is gradually set up. The mother-raised infant, on the other hand, can eat whenever it is hungry—every hour or two; since the real thing is always available, there is no reason for seeking a substitute. Once the habit is established, in the nursery infant, thumb sucking may persist for many years, ap-



The baby begins to grow up—Alf at 3 years.

pearing whenever the animal is under tension and sometimes, apparently as a reaction to boredom, there being nothing better to do.

Any chimpanzee which has been captured in Africa where these animals construct a new sleeping nest every evening, will, when given access to a tree, revert to the custom even after years of no practice. Our nursery-reared chimpanzees, on the other hand, never construct nests, no matter how favorable the opportunity. Unlike birds, in whom nest-building is an instinct, this activity is evidently a cultural acquisition among chimpanzees; something that the younger generation learns from its elders. Where such educational opportunities are lacking, the custom drops out.

By human standards the chimpanzee is both intelligent and stupid. That is, in certain activities this ape manifests an almost human intelligence, far beyond the abilities of subprimate animals. In other types of problem, on the other hand, the solution of the chimpanzee is on a distinctly lower, animal level. As an example of intelligent behavior, the recent performance of an adult male in mastering a set of discrimination problems may be cited. These problems were so arranged that in any given choice the ape had to "bear in mind" five distinct factors: which of two objects was the correct one depended on its size, its shape, its color, and on the presence or absence of two further aspects of the situation. The following symbolic representation, which shows only a part of the problem (i.e., four factors, rather than five) mastered by the chimpanzee, may help to clarify the task involved. In each of the eight pairs of choices shown, the left-hand one is correct, the right-hand one is wrong:

A ₁ B ₁ C ₁ D ₁	vs.	A ₂ B ₁ C ₁ D ₁
A ₂ B ₂ C ₁ D ₁	vs.	A ₁ B ₂ C ₁ D ₁
A ₁ B ₂ C ₂ D ₁	vs.	A ₂ B ₂ C ₂ D ₁
A ₂ B ₁ C ₂ D ₁	vs.	A ₁ B ₁ C ₂ D ₁
A ₂ B ₁ C ₁ D ₂	vs.	A ₁ B ₁ C ₁ D ₂
A ₁ B ₂ C ₁ D ₂	vs.	A ₂ B ₂ C ₁ D ₂
A ₂ B ₂ C ₂ D ₂	vs.	A ₁ B ₂ C ₂ D ₂
A ₁ B ₁ C ₂ D ₂	vs.	A ₂ B ₁ C ₂ D ₂

Without the aid of paper and pencil, even the human mind finds difficulty in responding to five different and independent factors at the same time.

In what the psychologist calls "social intelligence" the chimpanzee is very keen indeed. This

may be seen both in the relationship of chimpanzees to each other and to man. Wendy is one of our chief offenders in regard to jail-breaking. One of her principal pleasures in such escapes might seem to be the satisfaction derived from outwitting her captors, for, after a few hours of wandering in the nearby woods she is ready enough to return to her cage and, incidentally, to three free meals a day. Our cages are strongly built, so that it takes long, patient effort to produce an opening large enough for an ape to squeeze through. Wendy picks as inconspicuous a spot as possible and never works at her illegal occupation while people are about. There are indications (but here we are going beyond verified fact) that during her days of surreptitious activity, Wendy engages in various exhibitionistic antics intended to distract our attention away from the secret spot. It seems not improbable, also, that she completed all the tedious but not easily noticed work of untwisting the wire ends, before bending the wires back to form a conspicuous hole. Most of the jail-breaks occur at times (e.g., early evening) when there are few people around.

The chimpanzee is highly sensitive to the mood and attitude of his fellow primates. The question of who is to be boss among new cage-mates is usually settled without an overt fight. The female "knows" that at certain phases of her sexual cycle she can take more liberties, can appropriate a greater share of the food from her male companion, than at other times. Sheer strength plays an important role in determining dominance and leadership, but it is by no means the only factor shaping the pattern of social relationships within a group of chimpanzees. Ingenuity, trickery, bribery and guile may become more effective than brute force. Some individuals are very successful in getting others to fight their battles or to assist them in a task requiring cooperation. The two cornerstones of social integration, a basic need for companionship and the intelligence to recognize the advantage of working together and of exchanging favors, are both discernible in the behavior of chimpanzees. The factors which make for companionship preferences are varied and subtle; certain individuals are much more sociable and popular than others. In this connection it is interesting to note that

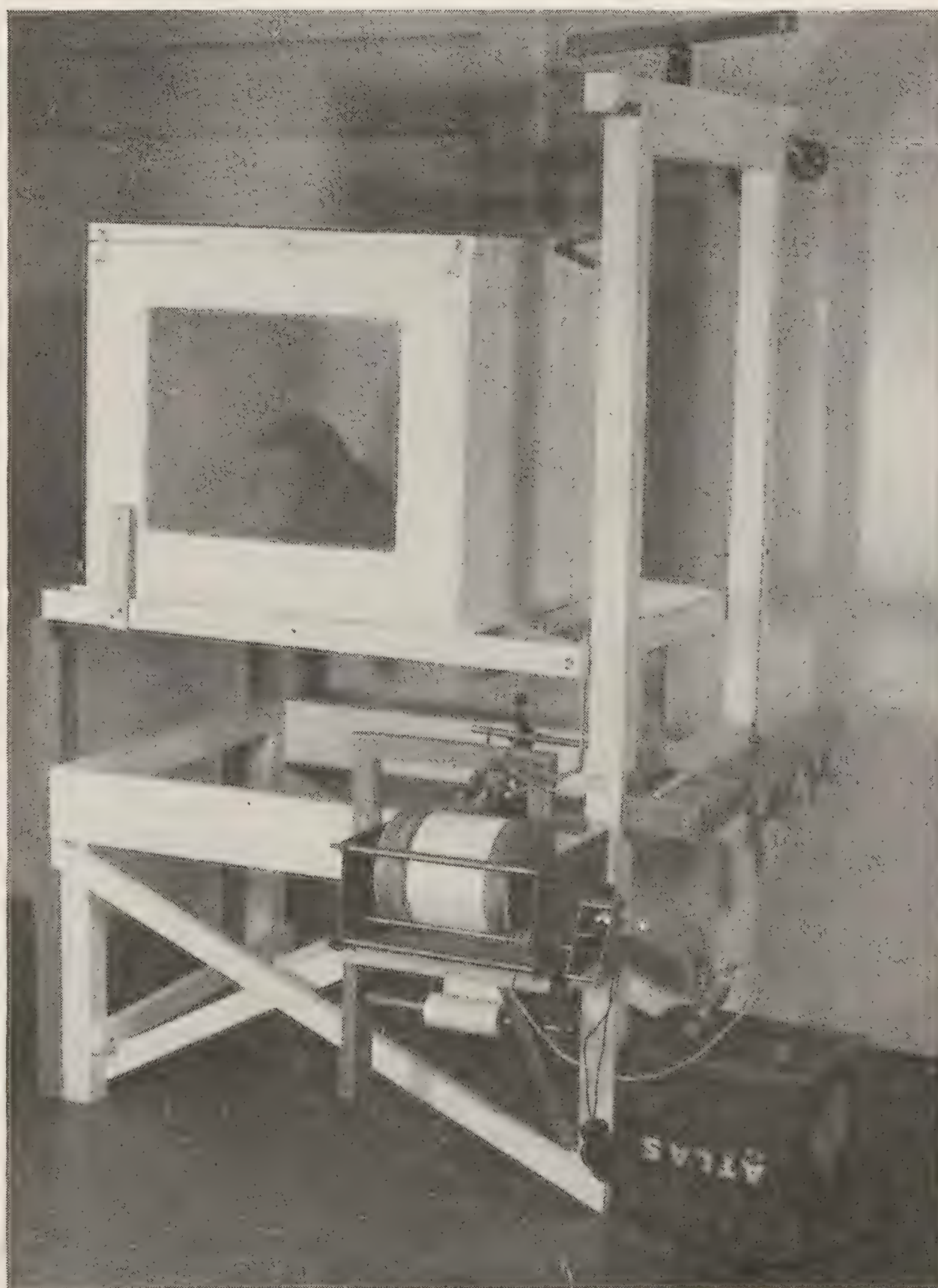


(Left). Here the reactions of a young chimpanzee to various objects are being tested by a member of the Laboratories staff.

(Below). This apparatus, designed by Dr. Austin H. Riesen of the Laboratories staff, is used for measuring the activity rhythm of young chimpanzees.

these animals especially attached to, and dependent on, their human contacts often do not form close friendships with their fellow apes.

As examples of "stupid" behavior may be included most of the problems which man typically solves with the aid of language processes. Problems requiring counting, for instance, are very difficult for the chimpanzee. Habits in which the consequence of the response — reward or punishment — do not follow the performance immediately, are not easily learned. When the human child is spanked by his father at night for having stolen cookies that morning, we have some reasonable expectation of curing the child of stealing. The chimpanzee quickly proves his ability to distinguish red from green by consistently pushing against a green button and never against the red one — if green-pushing (but not red-pushing) is always rewarded *at once* by a raisin or other tid-bit. But we cannot tell the ape that he is now being rewarded for having pushed the green button, rather than the red one, five minutes ago. And apparently the animal cannot tell himself,



either; he has no bridge of symbols to close that time-gap between what he did a little while ago and what is happening now. (It should be pointed out, however, that if the ape is at once given a material token of reward — a poker chip, for instance, which later can be traded in for raisins — the habit thus indirectly rewarded will be learned quite easily). The chimpanzee has an excellent memory in the more common sense of that term, but naturally it cannot remember something that it has not yet learned. Many problems, easy for us, are impossible for the ape because it has such a limited capacity for dealing with objects and events not present to the senses. Although we cannot yet be sure what is the cat and what the horse — that is, whether language or the higher levels of intelligence came first — certain it is that together with language man acquired intellectual powers which set him far beyond his non-verbalizing relatives. From the lowest to the highest animals we find only gradual increases in intelligence. Then, suddenly, in passing from ape to man, we have a terrific forward leap. That great and abrupt gain is somehow related to the use of symbols, as seen most strikingly in language. In the primates, and particularly in the chimpanzee, we can discern the early glimmerings of symbolically mediated behavior, and by a careful study of this development we may hope to gain, eventually, some insight into the truly unique feature of human intelligence.

The work of the Orange Park laboratory can here be indicated only in its most general outlines. It is the only place — outside the jungles of Africa! — where chimpanzees are bred in any number. From time to time some of these animals are sent to other laboratories throughout

the country for specific studies in medicine, in brain physiology, or in behavior. The present laboratory research program includes studies of growth and of factors which influence and control development; long-term investigations aimed at the description and analysis of behavior, with a constant search for the basic principles of laws of behavior; physiological studies of the relationship of the endocrine glands to normal and abnormal behavior; and, last but not least, experiments seeking to reveal the neurological processes and structures responsible for the various aspects of personality, emotional expression, drive and intellectual capacity. Pervading all these lines of inquiry is the problem of modifiability: which aspects of the total behavior pattern can be changed or influenced by environmental agencies, by training, teaching, experience, by drugs, diets, hormones, operations—and which are fixed immutably by the hereditary constitution of the organism? The purpose of all this may be summarized, briefly, as an attempt to gain deeper understanding, and thus greater control, of the living world in general and of man, the highest primate of them all, in particular.

In 1942 Professor Yerkes retired from the directorship of the Yale Laboratories of Primate Biology which were thereupon renamed the Yerkes Laboratories of Primate Biology in his honor. Harvard University joined Yale in sponsoring the enterprise and Dr. Karl S. Lashley, Professor of Neuropsychology, was named Director. World War II has indeed imposed heavy handicaps on research, but in this fortunate country of ours it has been possible to maintain this valuable colony of experimental animals and to continue, on a small sector at least, man's never-ending struggle towards greater knowledge and wisdom.

The POISONOUS SNAKES of the NEW WORLD. Part 3

By CLIFFORD H. POPE

Fellow of the New York Zoological Society; Curator of Reptiles of the Chicago Natural History Museum.

[This article is a portion of a booklet of the same title, previously published by the Zoological Society.]

COPPERHEAD, *Agkistrodon mokeson* (Figures 21, 22). As already explained, this pit-viper is only found south of a line connecting the northeastern tip of Massachusetts with Pittsburgh and that city with the extreme southeastern corner of Nebraska; and east of one extending from this corner of Nebraska to the upper Rio Grande in Texas and passing just southeast of New Mexico. It is not known from peninsular Florida. The copperhead and water moccasin (Figure 23) are the sole pit-vipers without rattles that live in this whole southern and eastern segment of the United States, but the latter, as stated above as well as below and reiterated here for emphasis, is not found north of the lowlands.

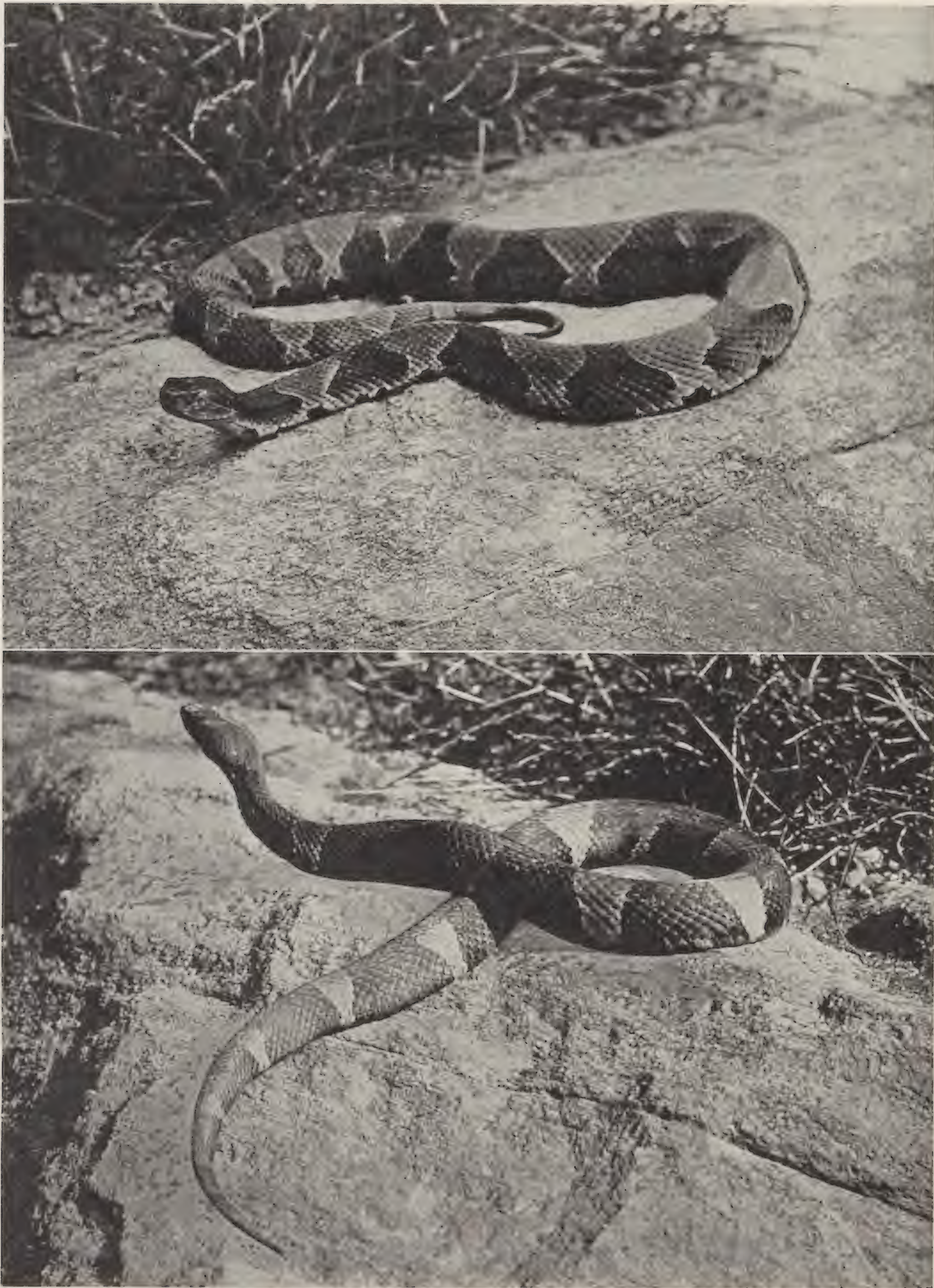
The copperhead differs enough in pattern from one part of its range to another to have received four technical subspecific names. There is no necessity to describe these forms here as the only other snake with which any of the four can be confused is the water moccasin. When such a confusion threatens, certain facts may be helpful: the copperhead is terrestrial, inhabits extensive northern and western areas where the other species is not found, and the pattern of broad cross-bands has a predominantly coppery hue; the water moccasin is aquatic, lives only in the southern lowlands (including peninsular Florida where copperheads are unknown), and has a pattern of broad cross-bands largely brown, olive,

and black. Old water moccasins tend to be dark, whereas the young are gaudily colored and much more easily confused with copperheads than are the adults.

The average copperhead is between thirty and thirty-six inches long although a length of more than fifty has been recorded. The species is not vicious. Like the banded rattlesnake, with which they often hibernate, copperheads have the reputation of preferring wooded mountainous country abounding in rocky ledges, but they actually frequent almost every type of rugged country.

WATER MOCCASIN, *Agkistrodon piscivorus* (Figure 23). Several harmless water snakes commonly called "water moccasins" are so consistently confused with this species, that the reptile man is all but driven to introduce the terms "true" and "false" moccasins. No matter how many people persist in calling harmless aquatic snakes from the elevated eastern parts of this country "water moccasins," the fact remains that the highly dangerous pit-viper of our southeastern lowlands, often known as the "cottonmouth," is the one reptile to which this name is properly applied. These lowlands, as already indicated, lie approximately south of a line extending from Cape Charles, Virginia, to the midpoint of the Alabama-Georgia boundary, thence to the center of the southern third of Illinois and from there to the junction of the Pecos and Rio Grande Rivers, Texas. Recent investigations have shown that the water moccasin is divisible into an eastern and western subspecies but the differences between these are hardly noticeable.

Almost any kind of a permanent aquatic situa-



Upper — Fig. 21. Copperhead, *Agkistrodon mokeson mokeson*, northern subspecies. Range: Eastern United States between the lowlands and the extreme north. Average length: 33 inches. Bite not fatal to adults.

Lower — Fig. 22. Copperhead, *Agkistrodon mokeson laticinctus*, broad-banded subspecies. Range: South-central Texas northward to southern Kansas. Average length: 33 inches. Bite not fatal to adults.

tion may attract this snake, although it is partial to ponds, lakes, and streams with wooded shores and banks. The average length is forty-two, the maximum sixty inches, so it is hardly necessary to say that this deadly reptile, which is not always inclined to retreat from man, should be let strictly alone.

CORAL SNAKE, *Micrurus fulvius* (Figures 1, 25). Only inhabitants of our southeastern lowlands as approximately delimited under the foregoing account of the water moccasin need worry about the coral snake. Indeed, this species is unknown in Illinois because it does not range as far up the Mississippi valley as does the moccasin. The coral snake is one of three southern snakes that have areas of bright red, yellow, and black on the back. Since the other two are entirely harmless, much human nervous wear and tear can be avoided by learning to recognize them as innocuous. The rule is simple: look at the head as far back as the eyes and if it is red, discard all feeling of alarm because the coral snake has a black snout. If the head is hidden or missing, the identification still can be made because only the coral snake has wide alternating bands of black and red separated by narrow fillers of yellow, i.e. there is a yellow band for every black as well as for every red one, or twice as many yellow fillers as there are either red or black bands. In both of the other black, yellow, and red snakes the alternating bands (unequal in width) are red and yellow, the fillers, which happen to be wide, black. It is also well to remember that the colored areas of the coral snake are bands that completely encircle the body, a condition present in only one of the troublesome "mimics." In few snakes are back and belly patterns similar, so a widespread knowledge of the condition in the coral snake will save reptile life and human worry. Coral snakes vary enough from one part of the range to another to have received three subspecific names but these minor differences do not interfere with ready identification.

It has been stated that the coral snake does not coil and strike after the manner of so many harmless snakes, but this difference in behavior is more useful in the tropics where numerous kinds of coral snakes and their "mimics" abound, and learning pattern distinction becomes too involved.

Our common coral snake reaches an extreme length of thirty-nine inches, but the average adult measures only twenty-eight. Individuals vary in temperament, some being indifferent even to rough handling, others biting viciously when molested. This fact, combined with realization that the venom is of great potency, will make any reasonable person treat these beautiful reptiles with due respect. On the other hand, their slender bodies, short fangs, and habit of remaining flat rather than rearing to strike keep them from being a menace to the well-shod hiker wearing long trousers.

ARIZONA CORAL SNAKE, *Micruroides euryxanthus* (Figure 26). This rare species is confined to parts of southern Arizona with an altitude of less than 5,000 feet. It is small; no specimen measuring more than eighteen inches has ever been found. Presumably the venom is highly toxic. The color arrangement suggests that of the southeastern species (Figures 1, 25) but the fillers are wide and white, not narrow and yellow. A black snout distinguishes the Arizona coral snake from other brightly banded snakes of that state. It is interesting to note that, beginning with the snout, the color order of bands is black, yellow, black in the southeastern species; black, white, red in the other. One might say that on the body the black bands precede the red in the former, the red precede the black in the latter.

THE HIGHLANDS OF MEXICO

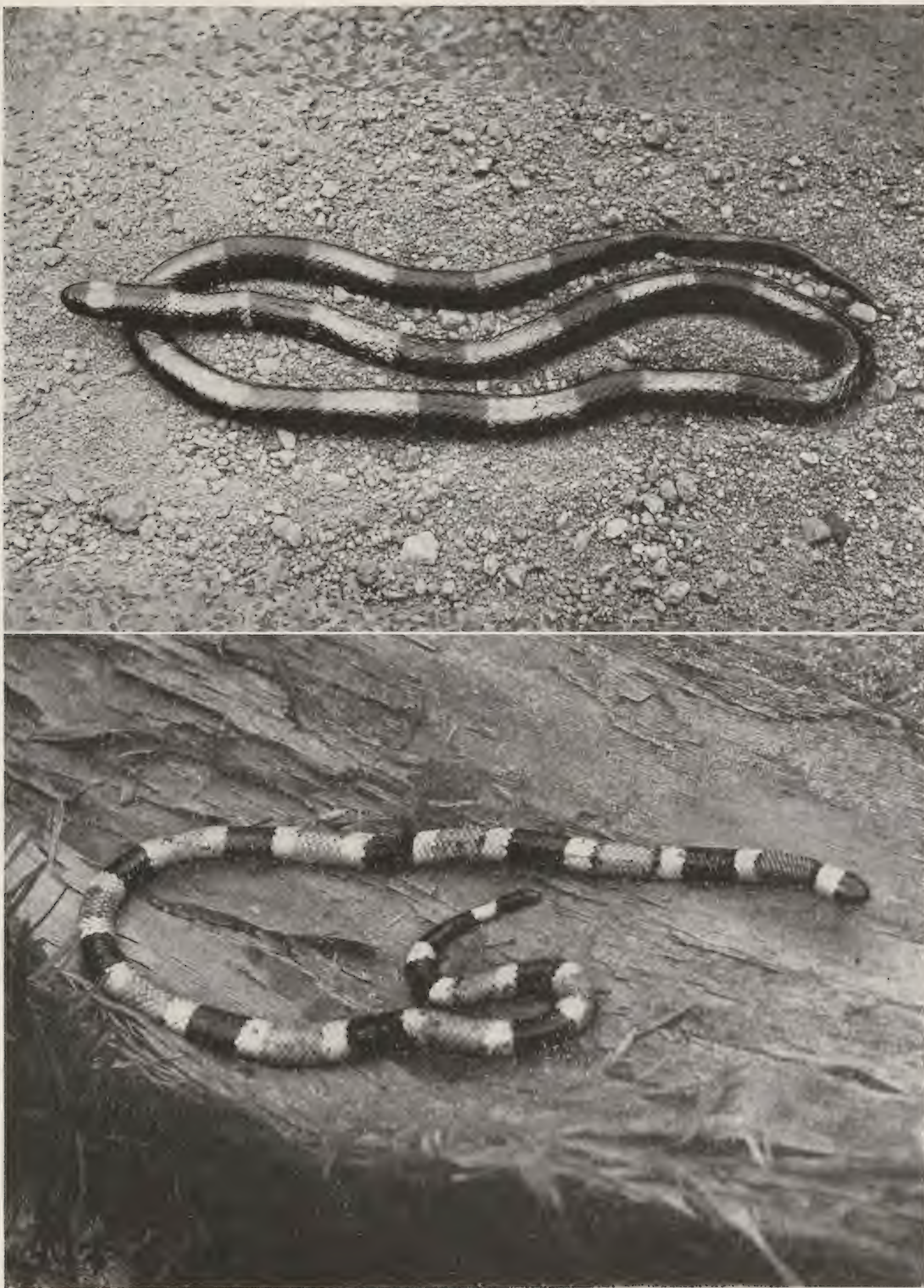
The Mexican highlands include Lower California and all of the plateau of Mexico north and west of a line connecting the city of Veracruz with the Gulf of Tehuantepec. This plateau, with the exception of its relatively low north-eastern section just south of the Big Bend of the Rio Grande, stands 5,000 or more feet above sea-level. The low coastal strips (excluding those of Lower California) being inhabited largely by tropical animals, are considered with the next section.

The highlands of Mexico, actually a continuation of the "rattlesnake belt" of our own southwest, harbor not only all the species found in our border states but, toward the south, a few additional ones. Students of rattlesnakes believe that, during the course of evolution, these pit-vipers radiated from the north-central part of the Mexican plateau to become dispersed over North



Upper — Fig. 23. Water Moccasin, *Agkistrodon piscivorus*. Range: Lowlands of southeastern United States. Average length: 42 inches. Highly dangerous.

Lower — Fig. 24. Mexican Moccasin, *Agkistrodon bilineatus*. Range: Tropical Mexico to Nicaragua. Average length: Probably about 30 inches. Presumably very poisonous.



Upper — Fig. 25. Coral Snake, *Micrurus fulvius*. Range: Southeastern United States and eastern Mexico in lowlands. Average length: 28 inches. Poisonous.

Lower — Fig. 26. Arizona Coral Snake, *Micruroides euryxanthus*. Range: Southern Arizona and northern Mexico. Maximum length: 18 inches. Poisonous.

and South America. The other poisonous snakes of the plateau are found only in its extreme north across the international boundary from where they occur in the United States. They are: the water moccasin (Figure 23) in the Rio Grande valley below the Big Bend; the copperhead in the Big Bend region; the Arizona coral snake (Figure 26) in Sonora and possibly adjacent Chihuahua. Actual Mexican records for the first two do not exist, so the ranges in that country cannot be accurately delimited.

THE WEST INDIES AND TRINIDAD

The Greater and all but two of the Lesser Antilles are devoid of poisonous snakes.

The fer-de-lance (Figure 32), a large and highly dangerous tropical pit-viper described in the section on tropical America, is found on Martinique and St. Lucia.

Trinidad, an elevation of the South American continental shelf, is surrounded by waters not more than 500 feet deep. As might be expected, its snakes are essentially the same as those of the adjacent mainland; pit-vipers, including the fer-de-lance and the bushmaster (described below next to the fer-de-lance), and coral snakes abound.

TROPICAL AMERICA

As here understood, tropical America is that part of the New World inhabited by a tropical fauna rather than the territory actually lying between the Tropics of Cancer and Capricorn. In Mexico, this fauna goes a little beyond the geographical tropics along the Mexican coasts to the valley of the Rio Grande on the Gulf side, to southern Sonora on the Pacific; in South America, the latitude (35° south) of the mouth of the Rio de la Plata marks the limits of the faunistic tropics.

The only parts of this vast area entirely devoid of poisonous snakes are the Andean highlands lying at an altitude of 10,000 feet or higher, and all of Chile. Peru west of this highland is inhabited by a relatively small number of dangerous species; two small pit-vipers without rattles and two coral snakes. Uruguay has, in addition to the tropical rattlesnake (Figure 30), two pit-vipers without rattles and two coral snakes. Both of the pit-vipers (Maximilian's and the urutu, Figure 36) and one of the coral snakes (*Micrurus*

frontalis) are described below in the section on temperate South America. The other coral snake (*Micrurus corallinus*) has a black snout and an unmistakable pattern of red, yellow, and black markings in the form of rings that completely encircle the body, making the belly look essentially like the back. The black and red rings alternate, the red ones being two to three times as wide as the black and separated from them by yellow rings only half as wide as the black. Thus there are two yellow rings for every red and black one. The scales of the red areas are black-tipped. The average length is between twenty-four and twenty-eight inches, the maximum thirty-nine.

The groups of poisonous snakes found in tropical America are the same as those of northern temperate America: pit-vipers with and without rattles, and coral snakes. The relative numbers of tropical kinds by groups are the converse of what they are in the north: few species of rattlesnakes but many of rattle-less pit-vipers and coral snakes. The pit-vipers, as already explained in detail, are identified by their facial pit and large, movable fangs, but the coral snakes, about fifty in number, present a problem for they are variously banded with red, yellow (or white) and black; red and black; or yellow (or white) and black, combinations of color found on many harmless species. The only safe plan is to avoid all snakes with bodies completely encircled by bands of such colors (making their bellies look like their backs) unless, when annoyed, they throw the forebody into S-shaped loops, raise it, and strike after the manner of ordinary snakes. Descriptions of all the species would be useless and little or nothing is known about their habits.

In contrast to the coral snakes, the pit-vipers are readily distinguished as such, but identification by species presents an insurmountable problem for the layman since even reptile students name them with great difficulty. Some of the well known species are recognizable because of distinctive habits, coloration, or size, and these will be taken up one by one.

TROPICAL RATTLESNAKE, *Crotalus durissus* (Figure 30). A pair of parallel dark stripes extending along the neck is a characteristic of this, the only widely distributed rattlesnake of tropical America. The rattle is sufficient identification except in the two limited mainland areas where another species may occur with it. The "cas-

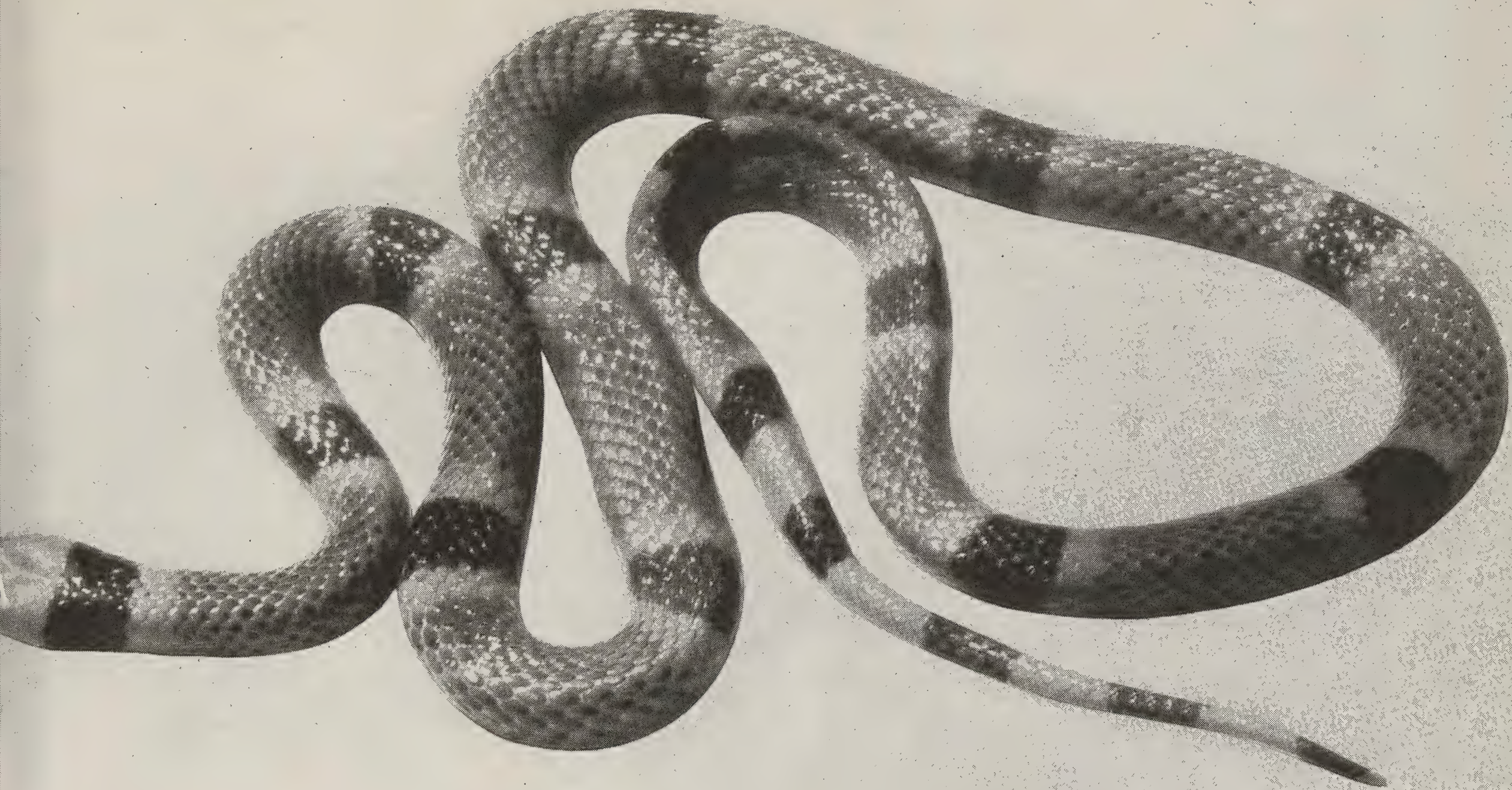


Fig. 27. Central American Coral Snake, *Micrurus nigrocinctus*. Range: Tropical Mexico to Panama. Average length: About 28 inches. Poisonous.

cabel," as the tropical rattler is called in Spanish, occurs in southern Mexico from central Michoacan (below the plateau) to about 32° south latitude in South America. There are no records for Panama, and the population to the north of this country differs enough from that of South America to have its own subspecific name; most of the differences are too slight to concern the layman. In spite of an extensive range, this snake is unknown in many parts of tropical America because it avoids the coastal plains and tropical rain forests, frequenting instead dry, hilly to mountainous districts devoid of heavy cover. For example, it has not been taken in the Amazon basin but there are numerous records for the highlands to the north and to the south of this wet, densely forested region.

Only two rattlesnakes, the diamond-backs of the United States (Figures 2, 4, 5), surpass cascabels of the northern and somewhat larger subspecies in average size, and the western diamond-back is but little larger. The average tropical rattler of North America is about fifty-seven inches long. The largest one on record measured sixty-six and three-quarters inches but longer ones doubtless exist as relatively few

have been measured; in the tropics, preservation and transportation of big animals present difficulties. Size, an especially potent venom, and an aggressive disposition combine to make this the most dangerous of rattlesnakes. When surprised, it often strikes after a few clicks of the rattle have given scant warning, and the reach is higher than in other species. Prolonged annoyance will make a cascabel actually advance upon its tormentor, something that the northern rattlesnakes never do. The cascabel often bites before coiling.

MEXICAN WEST-COAST RATTLESNAKE *Crotalus basiliscus*. This kind rivals its near relative, the tropical rattlesnake, in size and lives along the western coast of Mexico from central Sinaloa to central Oaxaca, the ranges overlapping from Michoacan to Oaxaca. The two may be distinguished at a glance: the west-coast species lacks the dark neck stripes of the cascabel. No other rattlesnakes occur in the Mexican lowlands occupied by these formidable giants. Little is known about the habits of the Mexican west-coast rattlesnake, which long was regarded as merely a subspecies of the tropical rattler.

WESTERN DIAMOND-BACK RATTLESNAKE, *Cro-*

talus atrox (Figures 2, 5). This temperate species is included here because the southern extremity of its range extends into the tropical area for a short distance on both coasts of Mexico; on the west, nearly all of Sonora is inhabited; on the east, the entire state of Tamaulipas and seemingly the northern tip of Veracruz. An account of this gigantic reptile has already been given.

TOTONACAN RATTLESNAKE, *Crotalus totonacus*. The Totonacan rattlesnake is a rare reptile known only with certainty from Panaco Island lying about seventy-five miles south of Tampico, Veracruz. A specimen said to have come from southern Chiapas was received by the Staten Island Zoological Society in 1940, the year the species was first made known to science. The longest of the three individuals on record measures sixty-five and a half inches, so the species is large and presumably highly dangerous even though the captive just mentioned was astonishingly docile. Two additional species with limited ranges are described below chiefly to complete the list of rattlesnakes of the tropical region.

ARUBA RATTLESNAKE, *Crotalus unicolor*. Aruba Island lying about twenty-five miles off the coast of Venezuela is the home of this species which is pale gray above, white beneath. The largest specimen on record was thirty-seven and a half inches long. A female exhibited by the Staten Island Zoological Society gave birth to twelve premature young.

URACOAN RATTLESNAKE, *Crotalus vegrandis*. Two specimens from the State of Monagas, Venezuela, were given this name in 1940. They are smaller than their close relative, the tropical rattlesnake (Figure 30), and the blotches of the back are almost obliterated by numerous white-tipped scales.

WATER MOCCASIN, *Agkistrodon piscivorus* (Figure 23). This snake may occur in the lower Rio Grande valley but it is not certainly recorded. It is described above in the section on the United States.

MEXICAN MOCCASIN, *Agkistrodon bilineatus* (Figure 24). Among the twelve rattle-less pit-vipers of Mexico's lowlands, this reptile stands out as the only one with a wide distribution along both coasts; it has been taken in southern Sonora on the west, and in the drainage of the Conchos River in the east. This river crosses northern Tamaulipas and is the first one south of the Rio

Grande. The "cantil," as this species is often called, ranges southward to western Nicaragua. It is readily recognized by two white or yellow lines that begin on the snout; one extends through the eye and across the temple, the other along the upper lip. The wide brown or black cross-bands of the back are bordered with white spots that become obscure in the adult. Very little has been written on the habits of this aquatic snake which is known to reach a length of thirty-nine inches. Presumably it is highly dangerous; a horse bitten by one is said to have died in twenty minutes.

BUSHMASTER, *Lachesis muta* (Figure 31). Only two rattle-less pit-vipers of gigantic dimensions occur in Costa Rica, Panama, Colombia, Venezuela and the Guianas. The larger of these, the bushmaster, is said to attain a length of eleven feet and some inches but most adults are apparently from seven to nine feet long; measurements of a large series have yet to be recorded. The range extends from the low altitudes of both coasts of eastern Costa Rica southward through the Amazon lowlands, with its extreme limits along the Brazilian coast in the State of Bahia. The bushmaster frequents forests where it often hides in abandoned mammal burrows.

Recognition of adults should be easy enough if two facts are kept in mind: the skin, especially on the head, is rasp-like because the center of each scale is raised; the ground color is light brown of a more or less pinkish hue, the conspicuous black blotches of the back are wide in the middle, narrow on the sides. This pattern makes a bushmaster coiled on the forest floor anything but conspicuous. Some individuals seem to take advantage of this protective coloration and remain motionless until actually touched, others attempt to escape, or, if annoyed, strike viciously, even edging toward an intruder. The tail is vibrated and if the snake happens to be in dry vegetation, it may be mistaken for a rattlesnake. In spite of more than one long account, we still know little about the bushmaster's reproduction except the habit of laying eggs, which is of considerable interest because all other pit-vipers of the New World bear living young. The female coils about her clutch of about ten white eggs, each approximately three and a quarter inches long. Bushmasters are delicate snakes in



Upper — Fig. 28. A harmless coral snake “mimic,” *Oxyrhopus trigeminus*, recognized as innocuous by the fact that the areas of color are not continuous across the belly. This species is widely distributed in South America.

Lower — Fig. 29. Another harmless “mimic,” *Erythrolamprus aesculapii*, in which the resemblance to a coral snake is striking because the areas of color form complete rings. Widely distributed in tropical America.

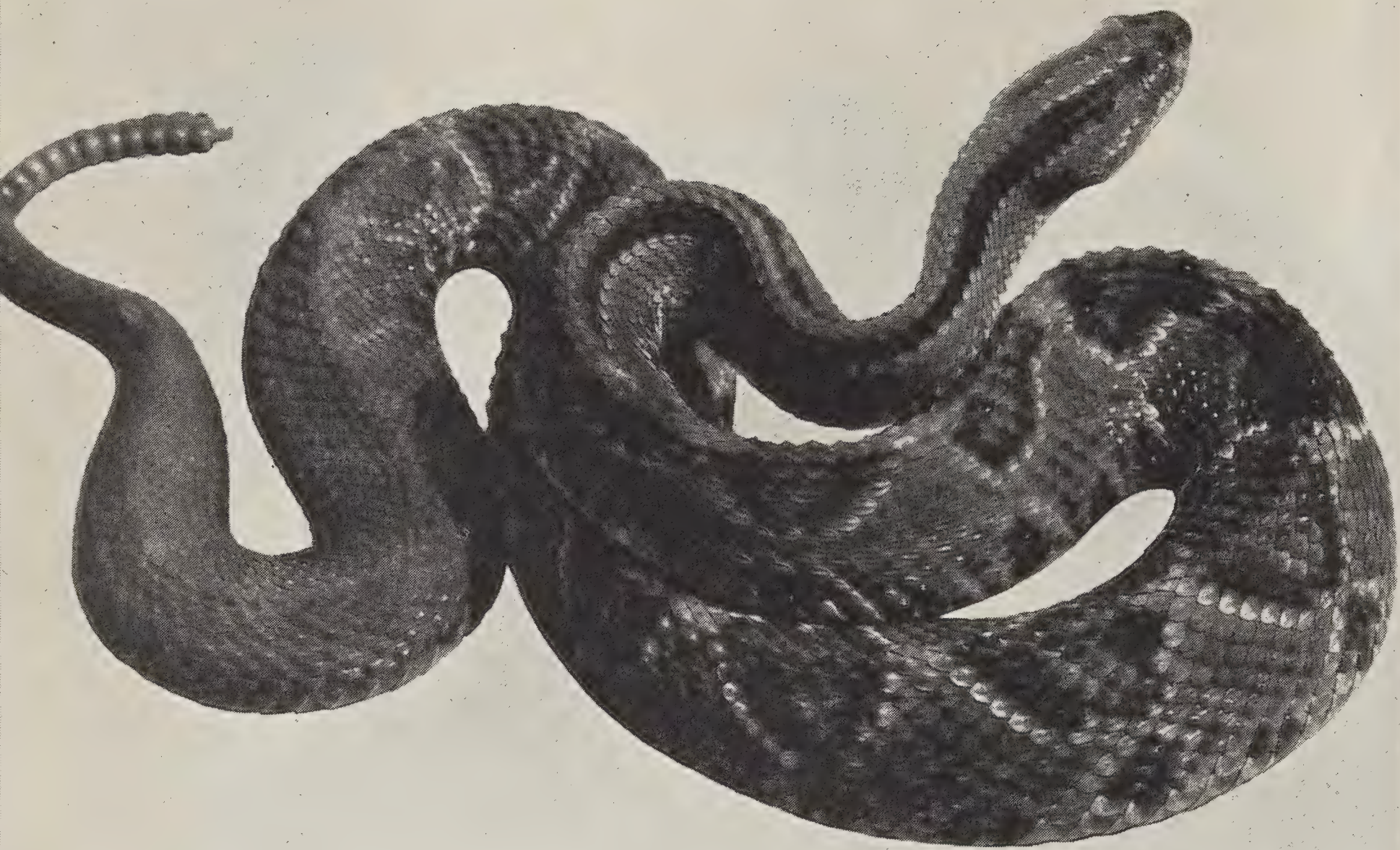


Fig. 30. Tropical Rattlesnake, *Crotalus durissus*. Range: Southern Mexico to Uruguay. Average length: About 57 inches in North, somewhat smaller in South America. Highly dangerous.

captivity and seldom find their way to zoological gardens.

FER-DE-LANCE, *Trimeresurus atrox* (Figure 32). The fer-de-lance, or BARBA AMARILLA, is the second of the two gigantic rattle-less pit-vipers found in Costa Rica, Panama, Colombia, Venezuela, and the Guianas. If we except the water moccasins already described, the fer-de-lance is the only gigantic pit-viper without a rattle that lives in Mexico at any altitude and in Central America above eastern Costa Rica where the bushmaster occurs. The Mexican moccasin (Figure 24) is hardly to be classed as gigantic, and the other water moccasin (Figure 23) is very rare in Mexico where its distribution is limited to the extremity along the Rio Grande.

The fer-de-lance ranges over nearly all of tropical America from eastern San Luis Potosi and perhaps southern Tamaulipas on the Atlantic side of Mexico and Guerrero on the Pacific to the State of Misiones in eastern Argentina (about 27° south latitude). Several other large and strikingly similar pit-vipers enter its territory south of the Amazon, so recognition there is difficult. Young individuals might readily be confused with various small species found north

of the Amazon basin, but large ones could be mistaken only for the bushmaster (Figure 31). The skin of the fer-de-lance is not rasp-like and the pattern, in contrast to the clear-cut one of the bushmaster, is variable and complex, with light-edged blotches that are narrow or broken along the middle of the back, wide on the sides. The ground color varies from gray to brown or reddish-brown.

The size varies from place to place. On Trinidad, the maximum length is said to be about seventy-two inches, the average fifty-four to sixty; in Central America, specimens eight feet in length are not rare and there the average size may even approximate that of the bushmaster. Measurements of large series are not on record. The habitat is little restricted, the fer-de-lance frequenting wet as well as dry areas and forests as well as open country or even cultivated fields. In contrast to the bushmaster, it is a hardy captive that feeds readily and sometimes will reproduce in confinement. The diet consists chiefly of small mammals and an unknown but probably small percentage of birds.

(To be continued)

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

BIRDS FROM SOUTH AMERICA

Near the end of October, 1944, a consignment of western Colombian birds reached the New York market, by boat. In ordinary times, such an event would be of weekly, almost daily, occurrence. But nowadays it is almost epochal, for since the early days of the war civilian movement of live stock by water has been almost non-existent. From our point of view, therefore, this shipment marks a turning point. Already, there is talk of further arrivals from South America and from African ports. It seems quite likely that before another year has passed we shall be receiving replacements in some degree.

The present shipment is not of interest merely from its occurrence. Even among the floods of pre-war days, it still would have been notable, for it included a number of birds not previously seen here alive. The best of these were Toucans of sorts and their smaller relatives, the Barbets. Excellent specimens of each form were secured for our collections.

The only large Toucan was a Lesser Wagler's (*Ramphastos ambiguus abbreviatus*), a particularly fine representative of a rare and striking form. Next in size is a Gray-breasted Aracari (*Andigena hypoglaucus*), a sombrely-colored creature in dark green and bronze, with gray-blue breast and collar. It is of particular interest to us because none of the several blue-breasted members of this genus seems to have appeared previously in captivity. Of the attractive Green Toucanets (*Aulacorhynchus*), we have had a number of forms but the little Gray-throated (*A. cyanolaemus*) does not seem to have been imported before. It is a charmingly tame, hand-reared bird, with body feathers of bright green satin, set off by a blue-gray throat.

All of the several species of Barbets found in tropical America are exceedingly rare in collections and we are very fortunate to have been able, so far, to exhibit four different forms. We now add a fifth, the Toucan Barbet (*Semnornis rhamphastinus*), largest and most brightly colored of

the group. This species first appeared in Europe in 1938 and has once before been imported into this country. The birds brought on the latter occasion, however, were in very poor condition and never left the importer's hands. The two we selected from the present shipment, however, are perfect and will soon be ready to grace one of our large planted aviaries.—LEE S. CRANDALL.

NEWS FROM LONDON ZOO

Through letters from friends in England, Mr. Delacour has learned that one flying bomb fell in the London Zoological Gardens during the summer, and several others landed in the vicinity. A good deal of damage was done to windows, doors and ceilings, and the bomb demolished the Hippopotamus-Giraffe House, one of the largest in the Zoo, the owl aviaries and the pheasant-ries, as well as a refreshment bar. All these structures will have to be rebuilt. No one was hurt and only two birds were killed. Some of the damage was repaired almost immediately and the animals were sheltered before cold weather. The Zoo continued open to the public all through the flying bomb raids.

After highly successful seasons, the Children's Zoo and the Farm-in-the-Zoo closed for the winter months on Sunday evening, November 12. The Children's Zoo will reopen on April 7, and the Farm on April 28.

Animal paintings, both in oils and water colors, by Charles Liedl will be exhibited in the Heads and Horns Museum Gallery from November 4 through January 1. Other work by the same artist was shown at the gallery in 1940.

NEW MEMBERS OF THE SOCIETY

New members of the Society since the last issue of this magazine are:

Irwin Rich	Annual	Henry Sleik
Mrs. Arthur A. Wacker		
	Life	
Seabury C. Mastick		

LEAF FISHES

Two of the curious South American Leaf Fishes (*Monocirrhus polyacanthus*) that look so much like dead leaves they can float within an inch of their unsuspecting prey have been put on exhibition in the Aquarium. They are the first specimens received here in ten years.

PUBLICATIONS OF INTEREST

THE BOOK OF NATURALISTS: An Anthology of the Best Natural History. 500 pp., 3 illus. Alfred A. Knopf, New York, 1944. \$3.50.

Give Will Beebe a book and a bottle and you have a happy man. With such a set-up he is accustomed to make a few magical passes with microscope and typewriter, and come out with another book — about the insects, lizards, fish or invertebrates bottled on one of his expeditions — either in literal bottles or in his memory.

Just now he has modified the formula and has been making passes over a whole library of books. The result is, as usual, another book, a corking book, a book to make you want to sit down by a winter fire, with your own bottle, and drift and dream through the centuries of man's adventures in trying to understand just a little bit about his co-animals.

"The Book of Naturalists" is an anthology of lively and significant natural history ranging from Aristotle (b. 384 B.C.) to Rachel L. Carson (b. 1907 A.D.). We learn what the Abbot Theobaldus presumably believed in the XIth Century about the reactions of whales to fires lighted on their backs, Linnaeus's astonishing description of a cat as an animal that does not have fleas, we see Charles Darwin wandering entranced in a Brazilian jungle and industriously collecting specimens in the Galápagos; Huxley lecturing the workingmen of Norwich on the mysteries of a piece of chalk; Maeterlinck making vivid poetry of the intricate lives of bees; William Morton Wheeler's humor inspiring "The Termitodoxa, or Biology and Society."

Stefansson on Foxes, Owls and Polar Bears, Akeley on Elephants, Seton on the Sea Otter, Gerald Heard's imaginative "The Emergence of the Half-Men" in which he dramatizes the "inchoate beginnings of humanity," and generous pages from Chapman, Peattie, Miss Carson (on the strange odyssey of the Eel) represent only a few of the 45 naturalists in the anthology. All are prefaced by Dr. Beebe's editorial notes, appreciating the place of the writer in the great current of advancing knowledge.—W. BRIDGES.

INDEX

Figures in **black type** indicate that the reference is, or includes, an illustration, map or design.

A

Abreu, Mrs. Rosalie, 138
Agkistrodon bilineatus, **146**, 150
 mokeson, 143, **144**
 laticinctus, **144**
 mokeson, **144**
 piscivorus, 143, **146**, 150
 Agouti, baby, Central American, 125
 Aleutians, 11-14, 69
 "Alice, Life with," book, 80
 Alsleben, Alfred A., 94
 American Committee for Wildlife Protection, 135
 American Wildlife Institute, 135
 Ancient animals, 37-41
Andigena hypoglaucus, 153
 "Animal Faces," book, 80
 Anteater, giant, 100, **101-103**
 Artists, animal, 70-77
Aulacorhynchus, 153
 cyanolaemus, 153

B

Baker, Dr. James A., 14
 "Barba amarilla," 152
 Barbet, Toucan, 153
 Beebe, Dr. William, 69, 154
 "Note on the Aleutian Flora and Fauna," 13, 14
 "Nouns of Multitudes of Animals," 17
 "Mid-Vistas of Zoo Life," 37-41
 Beckmann, drawing by, **71**
 Berlin Zoo, 18, 80
 Blaauw, F. E., 133, 136
 Blair, Dr. W. Reid, 80
 Bonnot, Paul, "Marine Cousins of the Bears," 106-110
 Bransom, Paul, drawing by, **75**
 Breder, Dr. Charles M., Jr., **24**, 120, 123
 Bridges, William, "Living in a Germ-free World," 14-17
 "Magna Charta of the Birds,"

33-36

 "Life with Alice," book review, 80
 "46 Baby Rattlesnakes," 125
 review of "The Book of Naturalists," 154
 Brightwell, L. R., "London Zoo Sees It Through," 18-22
 Bristol Zoo, 121
 Bull, Charles Livingston, drawing by, **76**
 Burrell, Harry, 53
 Bushmaster, 150
 Skull of, **85**

C

Carcharodon carcharias, 120
 Chace, Cpl. Earl, "Report from the Services," 9-11
 Chimpanzee, 137-142, **Cover No. 6** strength of, 32
 Chippendale, William H., "Capturing a Giant Anteater," 100-103
 Clères, 19, 136

Clifton Zoological Gardens, 121
 Coates, Christopher W., 24
 "Guide to Higher Aquarium
 Animals," book review, 127, 128
 Conservation laws, 33-36
 Coolidge, Harold, 27
 Copperhead, 143, **144**
 Coral Snake, **82**, 145, **147**
 Arizona, 145, **147**
 Central American, **149**
 mimic, **151**
 Crandall, Lee S., 33
 "Owls Are Moving Again," 23
 "Three Tiger Cubs," 46-48
 "Harry Raven," 78
 "The Cubs Are Growing Up,"
 94-97
 "A Rare Baby Crane," 125-127
 "Birds from South America," 153
 Crane, Demoiselle, 125
 Paradise, 125
 Sandhill, 125
 Wattled, baby, 125-**126**, 127
 White-neck, 125
Crotalus adamanteus, **86**, 116
 atrox, **82**, **86**, 117, 125 150
 basiliscus, 149
 cerastes, **119**
 durissus, 148, **152**
 horridus, **88**, 117
 lepidus, **118**
 mitchillii, **116**
 molossus, **114**
 ruber, **115**
 scutulatus, **115**
 tigris, **117**
 totonacus, 150
 unicolor, 150
 vegrandis, 150
 viridis, 118
 lutosus, **112**
 oreganus, **89**
 viridis, **89**
 Cuscus, **30**

D

Dasyprocta punctata, 125
 Delacour, Jean, 104
 Foreword to "London Zoo Sees It
 Through," 18, 19
 "Government Refuges Are Saving
 the Trumpeter Swan," 130-136
 Delagi, Nicholas F., photo by,
 Cover No. 5
 Donahue, Pvt. Ralph, 69
 "Report from the Services,"
 9, 11-13
 Doubleday, G. R., 21

E

Eadie, Robert, 53
 Edge, Mrs. C. N., 133
 Egret, plumes, **34**
 Ehmann, William H., 34
 Elephant, "climbing," 1

Emergency Conservation Committee,
 133
Emmydrichtys vulcanus, 124
 "Entomology, Outlines of," book
 review, 24
Erythrolamprus aesculapii, **151**
Eumetopias stelleri, 107
 Extinct animals, 37-41
 Ezra, Alfred, 18

F

Farm-in-the-Zoo, **128**, 153
 Feathers, trade in, 33-36
 Fer-de-lance, 152
 Ferguson, Dr. W. S., 14
 Fish and Wildlife Service, 134
 "Fish" or "Fishes?" 103
 Fish, poisonous, 122-124
 Fleay, David, "The Birth of a
 Baby Platypus," 50-69
 Fleming, Henry, review of "Outlines
 of Entomology," 24
 Flower, Major S. S., 45
 Follett, F., 133
 Fox, 99
 gray, 1
 ingenuity of, 69
 Frick, Childs, 27
 Fuertes, Louis Agassiz, painting by,
 74

G

Gabrielson, Dr. Ira, 134
 Gesell, Dr. Arnold, 139
 Gibbon, **29**
 Goose, domestic, skin of, 33
 Gordon, Dr. Myron, 14, 24
 Gorilla, 1
 Goss, Dr. Leonard J., 46-48
 Gourami, kissing, **Cover No. 1**
 Green, Col. Joseph I., 28
 Grönvold, drawing by, **73**
 Grubber, Manhattan, 40, **41**

H

Hamerton, Col. A. E., 21
 Hamilton, Captain William J., Jr.,
 "Yankee Naturalist in England,"
 98-99
 Harvard University, 142
 Hornaday, Dr. William T., 33, 36,
 80
 Horsfall, R. Bruce, painting by, **74**

I

Illustrations, zoological, 70-77
 India, 9-11

J

Jardin des Plantes, 136

K

Kai-shek, Mme. Chiang, 104

Kangaroo, 2-8
 Bennett's tree, **6**
 birth records of, 45
 black-faced, **7**
 gray, **5**, 121
 great red, **2**
 how babies get into pouch, 121
 Karluk, Alaska, **13**
 Kelley, Greame, drawing by, **38**
 Kellogg Sanctuary, 136
 Knight, Charles R., drawing by,
 39, **74**
 Kuhnert, Wilhelm, drawing by, **71**
 Kung, Mme. H. H., 104

L

Lachesis muta, 150
 Lashley, Dr. Karl S., 142
 Laythe, Leo L., 135
 Leaf Fishes, South American, 154
 Leister, Claude W., review of
 "Animal Faces," 80
 Leutemann, drawing by, **71**
 Liedl, Charles, 153
 London Zoo, 18-22, 153
 Longevity, of griffon vulture, 45

M

Mad Tom, 124
 Mammalogy, Journal of, 32, 36
 Mammals, of Pacific area, **26**
 Man, strength of, 32
 Marcy, Donald, "Those Bizarre
 Animals from Down Under," 2-8
 Martini, Mrs. Fred, 46, **47**, 48,
 94-97
 Massasauga, 111, **113**, 120
 Mastodon, "Broadway," 37, **38**, 39
 Maurice, Henry, 18, 21
 Melbourne Zoological Gardens, 51
 Meyerheim, drawing by, **71**
Micruroides euryxanthus, 145, **147**
Micrurus corallinus, 148
 fulvius, **82**, 145, **147**
 nigrocinctus, **149**
 Moccasin, Mexican, **146**, 150
 water, 143, **146**, 150
 Monkey, proboscis, **30**
Monocirrhus polyacanthus, 154
 Mullendore, Naomi, review of
 "Shrubs of Michigan," 126
 Mutzel, G., drawing by, **73**

N

National Audubon Society, 135
 Neave, Prof. Sheffield A., 21
 "Nellie, Old," 45
 Newman, Annie R., 104
 New York Zoological Society, 135
 Nigrelli, Dr. Ross F., 14, 24
 "Fish May Be Poisonous, Too,"
 122-124
 Nissen, Henry W., "The Ape
 Colony in Florida," 137-142
 Ngagi, gorilla, 1

O

- Onslow, Earl of, 18
 Opossum, 23
Opsanus tau, 124
Ornithorhynchus, 50-69
 Osborn, Fairfield, "Dr. Breder Takes Post at Museum," 24
 "Genesis of a Book," 27, 28
 "Charles Haskins Townsend," 42-44
 "Progress Report on 'The Pacific World' Series," 91-93
 Owl, 23, 99
 Pel's Fishing, **Cover No. 2**
Oxyrhopus trigeminus, 151
 Oysterfish, 124

P

- "Pacific World, The," 9, 26-32, 91-93
 Pam, Major A., 18
 Panda, giant, 20, 104
 Pangolin, 32
 Paradise, bird of, plumage, 34, 35
 Park, Yellowstone National, 132
 Perkins, R. Marlin, author of "Animal Faces," 80
 Platyfish, Mexican, 14, 15-17
Platypoecilus maculatus, 16
 Platypus, 50-69
 Pope, Clifford H., "The Poisonous Snakes of the New World," 82-90
 Part 2, 111-120
 Part 3, 143-152
 Prairie Dogs, **Cover No. 3**
 Puffer, Atlantic, 122

R

- Raccoon, 23
Ramphastos ambiguus abbreviatus, 153
 Rattlesnake, Aruba, 150
 banded, 88, 111, 117
 black-tailed, 114
 cane-brake, 117
 diamond-back, 86, 116
 Great Basin, 112
 horned, 119
 Mexican west-coast, 149
 Mitchell's, 116
 Mohave, 115
 Pacific, 89, 111
 prairie, 89
 red diamond, 115

- rock, 118
 southern pigmy, 113, 120
 tiger, 117
 timber, 118
 Totonacan, 150
 tropical, 148, 152
 Uracoan, 150
 western, 111, 118
 diamond-back, 82, 86, 117, 150
 babies, 125
 Raven, Harry, 78
 Refuge, elk, 133
 Malheur Lake, 133, 136
 Red Rock Lake, 132
 wildlife, 130-136
 Yellowstone National Park, 132
 Reptile House, interior of, 127
 Rhinoceros, "biting," 1
 Richards, Dick, author of "Life With Alice," 80
 Rimmer, Keeper James, 45
 Rungius, Carl, painting by, 74
Rutiodon manhattanensis, 40, 41

S

- Sealion, California, 106-110
 Piedras Blancas rookery, 109
 San Benito rookery, 106, 110
 Steller, 107
Sebastes maderensis, 123
 Schoonmaker, Dan, 104
 Scorpion fish, 123
 Scott, George, 23
Semnornis rhamphastinus, 153
 Shark, killer, 120
 Sharp, Dr. Ward, 135
Sistrurus catenatus, 113, 120
miliarius, 113, 120
 Snake, Arizona coral, 145, 147
 Central American coral, 149
 coral, 82, 145, 147
 poisonous, 82-90, 111-120, 143-152
 Specht, Friedrich, drawing by, 72
 Speed of animals, 36
Sphaeroides maculatus, 122
 Staten Island Zoological Society, 150
 "Steam Roller Circular," 36
 Stingray, 124
 Strength, man vs. chimpanzee, 32
 Swan, Australian black, 131
 Bewick's, 131
 mute, **Cover No. 5**, 131
 South American black-necked, 131
 trumpeter, 104, 130-136

- whistler, 131
 skin of, 33
 whooper, 131

T

- Tamandua tetradactyla*, 101, 102
 Tariff Act of 1913, 33-36
 Tarsier, 31
 Tee-Van, John, 104
 Helen, drawing by, 41
 Tetrodotoxin, 122
 Thorburn, Archibald, drawing by, 77
 Tiger cubs, **Cover No. 4**
 in Zoo, 46, 47, 48, 79, 94, 95-97
 Tiger, sabre-toothed, 39, 40
 Siberian, 46
 Toadfishes, 124
 Toucan, Gray-breasted Aracari, 153
 Lesser Wagler's, 153
 Toucanet, Green, 153
 Gray-throated, 153
 Townsend, Charles Haskins, 42, 43, 44
Trachinus draco, 124
vipera, 124
Trimeresurus atrox, 152

V

- Vevers, Dr. G. M., 19
 Vulture, griffon, 45
 longevity of, 45

W

- Wallaby, black swamp, 8
 Weever, 124
 Wetmore, Dr. Alexander, 132
 Wilwerding, Walter J., "A Short Account of Zoological Illustration," 70-77

Y

- Yale University, 137
 Yerkes, Robert Mearns, 137, 142

Z

- Zalophus californianus*, 106-110
 Zoo, Berlin, 18, 80
 Bristol, 121
 Children's, closing, 153
 London, 18-22, 153

THE AMERICAN BISON

by

MARTIN S. GARRETSON

Here is the whole story of the largest animal in North America, from its discovery by the Conquistadores 400 years ago until today. "The American Bison" delves into the prehistoric origin of the bison, searches the writings of early explorers for accounts of it, pictures its wide range and incredible numbers. This is the story of exploitation, near-extinction, and the rise of a strong national sentiment that saved the species.

254 pages, 65 illustrations *\$1.50*

Department B

Zoological Park, Bronx Park,
New York 60, N. Y.

THE POISONOUS SNAKES of the NEW WORLD

by

CLIFFORD H. POPE

One of the most popular and useful publications the New York Zoological Society ever issued was "The Poisonous Serpents of the New World" by the late Dr. Raymond L. Ditmars. Thousands of copies were sold. Now that booklet is out of print, and Mr. Pope, Curator of Reptiles of the great Chicago Natural History Museum, has prepared a new and longer text that will be extremely valuable to the layman.

56 pages, 42 illustrations *50 cents*

Department B

Zoological Park, Bronx Park,
New York 60, N. Y.

TROPICAL WILD LIFE IN BRITISH GUIANA

by

WILLIAM BEEBE, G. INNESS
HARTLEY & PAUL G. HOWES

Under the prosaic subtitle of "Zoological Contributions from the Tropical Research Station" Dr. Beebe and his associates produced a fascinating survey of subhuman life in a tropical jungle—mammals, birds, reptiles, insects, fish. Here are elaborate notes on the curious Hoatzins, descriptions of a tropical expedition at work, scores of magnificent jungle pictures. An early book by Dr. Beebe, but one packed with interest.

504 pages, 143 illustrations *\$1.50*

Department B

Zoological Park, Bronx Park,
New York 60, N. Y.

SERPENTS of the NORTHEASTERN STATES

by

RAYMOND L. DITMARS

There are many books on the identification of our local snakes, but this is still the simplest and in many ways the most practical for the layman who wants to know enough about snakes at least to keep out of their way! It tells what snakes are found in the Northeastern States, where they are most likely to be found, what to do if you are bitten by a poisonous snake, what they look like. Photographs of every species in this area.

60 pages, 41 illustrations *50 cents*

Department B

Zoological Park, Bronx Park,
New York 60, N. Y.



590.673

A59

ANIMAL KINGDOM

NEW YORK ZOOLOGICAL SOCIETY



VOLUME XLVIII

JANUARY TO DECEMBER, 1945

NUMBERS 1-6



INSTRUCTIONS TO BINDER

The 4-page signature forming the first 2 and the last 2 pages of this issue may be inserted ahead of the cover of Vol. XLVIII, No. 1, in binding the volume.



CONTENTS

No. 1. JANUARY-FEBRUARY

Shopping for a Jungle	Jocelyn Crane	3
Foreword by Fairfield Osborn		
The Oldest Zoological Park in North America .	Dr. Rafael Martin del Campo	14
Translated by William Beebe		
The Poisonous Snakes of the New World. Part 4	Clifford H. Pope	17
Behind the Scenes: News and Notes		23

No. 2. MARCH-APRIL

News from the Nursery	Lee S. Crandall	27
Birds Among the Coconuts	Major Richard T. Brice	32
The Poisonous Snakes of the New World. Part 5	Clifford H. Pope	44
It Died a Scarlet Ibis	Hattie Ettinger	48
The Humor and Myth of Linnaeus	William Beebe	51
Behind the Scenes: News and Notes		52

No. 3. MAY-JUNE

Four Years of Africa-in-the-Bronx	Lee S. Crandall	59
The Subtlety of <i>Leucochloridium paradoxum</i>	Ross F. Nigrelli	61
Insects Are Animals	Brayton Eddy	62
A Brilliant Flash — That's the Manakin's Display	Lee S. Crandall	67
The Key to Question House	Grace Davall	70
About Bull Snakes	Earl Jackson	75
Why Should I Join the Zoological Society?		80
Problem of the Invisible Baby Fish	William Bridges	82
Behind the Scenes: News and Notes		83

No. 4. JULY-AUGUST

The Farm-in-the-Zoo Appeals to City Folk	Leonard J. Goss	91
A Jungle Pigmy	Paul Griswold Howes	99
Multiple Uxoricide; or, the Two-inch Bluebeard	Christopher W. Coates	103
"Live" Organizations Are the Most Fun	Donald T. Carlisle	104
The Jewel Room		106
The Umbrella Bird Is Not a Dull Fellow Any More	Lee S. Crandall	109
People Are Curious About Insects	Brayton Eddy	113
Behind the Scenes: News and Notes		116

No. 5. SEPTEMBER – OCTOBER

The Significant Future of the Zoological Society	<i>Fairfield Osborn</i>	123
The Rare, the Strange, and the Beautiful	<i>William Bridges</i>	126
Perspective on the Zoological Society	<i>Jean Delacour</i>	135
Babies in the Zoo		138
Presenting — Bees and a Bee Tree	<i>Brayton Eddy</i>	141
Another Great Plan for This Society's Future	<i>Donald T. Carlisle</i>	146
"Let's Go to the Zoo!"		149
We Carry the Society Into the Jungle	<i>William Beebe</i>	152
Behind the Scenes: News and Notes		158

No. 6. NOVEMBER – DECEMBER

Family Affairs on Gibbon Island	<i>Lee S. Crandall</i>	165
The Zoological Society Is Going to Wyoming	<i>Fairfield Osborn</i>	168
Jungle Studio	<i>George Alan Swanson</i>	170
Insects in Winter	<i>Brayton Eddy</i>	176
A Swellfish Story	<i>Myron Gordon</i>	182
Behind the Scenes: News and Notes		187
You Can Make Christmas Last All Year		191
Index to Vol. XLVIII		193

590.673
A59

Mus

ANIMAL KINGDOM



BULLETIN, PUBLISHED BY
NEW YORK ZOOLOGICAL SOCIETY

DEPARTMENT OF TROPICAL RESEARCH FINDS A HOME IN THE JUNGLE, by Jocelyn Crane
AMERICA'S OLDEST ZOO, by Dr. Rafael Martin del Campo • News and Notes from the Zoo

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York 20, N. Y. ..

PRESIDENT

Fairfield Osborn

FIRST VICE-PRESIDENT

Alfred Ely

SECOND VICE-PRESIDENT

Laurance S. Rockefeller

SECRETARY

Harold J. O'Connell

TREASURER

Cornelius R. Agnew

EXECUTIVE COMMITTEE

Fairfield Osborn, *Chairman*

Cornelius R. Agnew
Alfred Ely
Marshall Field

De Forest Grant
Warren Kinney

William De Forest Manice
David H. McAlpin

Robert Moses
Harold J. O'Connell
Laurance S. Rockefeller

BOARD OF TRUSTEES

Class of 1946

George Gordon Battle
George C. Clark
F. Trubee Davison

Jay Downer
Robert I. Gannon

Robert Gordon McKay
Fairfield Osborn

Laurance S. Rockefeller
John M. Schiff
Frederic C. Walcott

Class of 1947

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez

De Forest Grant
Eugene Holman
Warren Kinney

Henry R. Luce
William De Forest Manice
Harold J. O'Connell

Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1948

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely

Marshall Field
Childs Frick
Archer M. Huntington

David H. McAlpin
John H. H. Phipps

Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Ex-officio, The City of New York

The Mayor, Hon. Fiorello H. LaGuardia

Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

John Tee-Van *Executive Secretary*

Jean Delacour *Technical Adviser*

Edward Kearney *Manager, Facilities Dept.*

William Bridges *Editor & Curator, Publications*

Claude W. Leister *Curator, Education*

Sam Dunton *Photographer*

Sanford Miles *Comptroller*

Quentin Melling Schubert, *Superintendent, Construction and Maintenance*

ZOOLOGICAL PARK

Lee S. Crandall . *General Curator & Curator of Birds*

Claude W. Leister *Associate, Mammals*

Leonard J. Goss *Veterinarian*

John Tee-Van *Associate, Reptiles*

Grace Davall *Assistant to General Curator*

W. Reid Blair *Director Emeritus*

William Beebe *Honorary Curator, Birds*

AQUARIUM

Christopher W. Coates *Curator and Aquarist*

C. M. Breder, Jr. . *Research Associate in Ichthyology*

Ross F. Nigrelli *Pathologist*

George M. Smith . *Research Associate in Pathology*

Myron Gordon *Assistant Curator*

Homer W. Smith . *Research Associate in Physiology*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*

Jocelyn Crane *Research Zoologist*

Henry Fleming *Entomologist*

George Swanson *Staff Artist*

Associates

William K. Gregory
John Tee-Van

Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

VOL. XLVIII

FEBRUARY 1, 1945

No. 1

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York 20, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York 60, N. Y. Title registered with United States Patent Office.

Subscription, \$1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

The Society and Conservation

Our thoughts regarding the Society's work in the field of conservation during the years immediately ahead are undergoing a considerable change. The impulses motivating us arise from a growing realization that emphasis must be placed to a greater degree than heretofore upon the preservation not only of wild animal life itself but at the same time upon the saving of natural habitat areas, namely, forests, soils and waterways, on which all animals, including man himself, are dependent. The velocity of destruction of these "living resources," not only in this country but in many parts of the earth, is infinitely greater than is generally realized. For example, continuance of the practice of burning or otherwise destroying forested areas in the sub-tropics and tropics, which results in soil erosion and the destruction of plant life, will bring about an inevitable diminishment, or even disappearance, of many present species of mammals and birds.

Historically, the Society's work in conservation has been pointed directly toward the preservation of species threatened with extinction, or toward the enactment of specific legislation protecting wild life. These activities must, of course, be energetically continued. At the same time it seems clear that the Society needs to broaden its program of conservation activities in order to contribute to a more general public recognition of what conservation means in its wider aspects. The essence of the whole matter is that wild animal life cannot exist unless its living places are preserved.

Fairfield Osborn

IN THIS ISSUE

New Guinea Short-headed Flying Phalanger	Sam Dunton	COVER
Shopping for a Jungle	Jocelyn Crane	3
Foreword by Fairfield Osborn		
The Oldest Zoological Park in North America . . .	Dr. Rafael Martin del Campo	14
Translated by William Beebe		
The Poisonous Snakes of the New World, Part 4	Clifford H. Pope	17
Behind the Scenes: News and Notes		23



From the cloud-swept balconies of Rancho Grande, one looks down the winding road that cuts through the jungle toward Maracay, half an hour away. The road is concrete and therefore passable at all seasons.

SHOPPING FOR A JUNGLE

By JOCELYN CRANE

Research Zoologist of the Department of Tropical Research.

FOREWORD BY FAIRFIELD OSBORN

The last few weeks have been filled with the finest kind of news concerning the future plans of the Department of Tropical Research. First, a communication has just come from the Government of Venezuela that it welcomed the opportunity of making available to the Society a property known as Rancho Grande, situated west of Caracas. This property is on a mountain-top, 3,000 feet up, in the midst of the undisturbed jungle of a preserved national park.

Meanwhile, the officials of the Standard Oil Company of New Jersey and of the Creole Petroleum Corporation of Venezuela have on many recent occasions evinced their great interest in the idea that a permanent station should be established in Venezuela and now express their readiness to arrange for the transport of personnel and equipment and to meet the cost of maintaining the expedition.

The combination of support and interest coming simultaneously from a Government and from large industrial corporations is in itself a notable incident. Constructive developments of this nature rarely, if ever, occur by accident. In this case they stem back over a long period of time, even to the early years of Dr. Beebe's first field work in the British Guiana jungles.

Two years ago, it will be recalled, the Department was stationed in the jungle near Caripito. Subsequently, Dr. Beebe and Miss Crane, through lectures in the major cities of Venezuela,

evoked widespread interest in the work that was being done. At that time the corporations mentioned above took an almost paternal interest in assisting the conduct of the work in numerous ways, and without their help the expedition would not have been possible. So successful was this entire project that it is only natural that it has now taken form in the manner described by Miss Crane in the accompanying article. To her goes great credit because, in the early part of 1944, she made a painstaking study of a number of possible locations for a permanent field station. It was an unusual sort of exploration trip, carried out with great thoroughness and care.

Rancho Grande is so ideally situated that it will provide the maximum of possibilities for fruitful results. Dr. Beebe and his staff will spend six months there during this year. Studies will include the conservation of wild life in the tropics and the habits of living creatures in the jungle. This will be the 45th Expedition of the Department. A series of lectures will be delivered by Dr. Beebe and his staff in the principal cities of Venezuela, Colombia and Ecuador. This project is the kind of work that will contribute, in the best possible sense, to better understanding between this country and the other republics of this hemisphere. Knowing the intensity and skill which Dr. Beebe and the members of his staff will use in pursuing their objectives, there is every reason to anticipate that this new venture will prove a highly important one in the annals of the Society.



Drawing by George Swanson

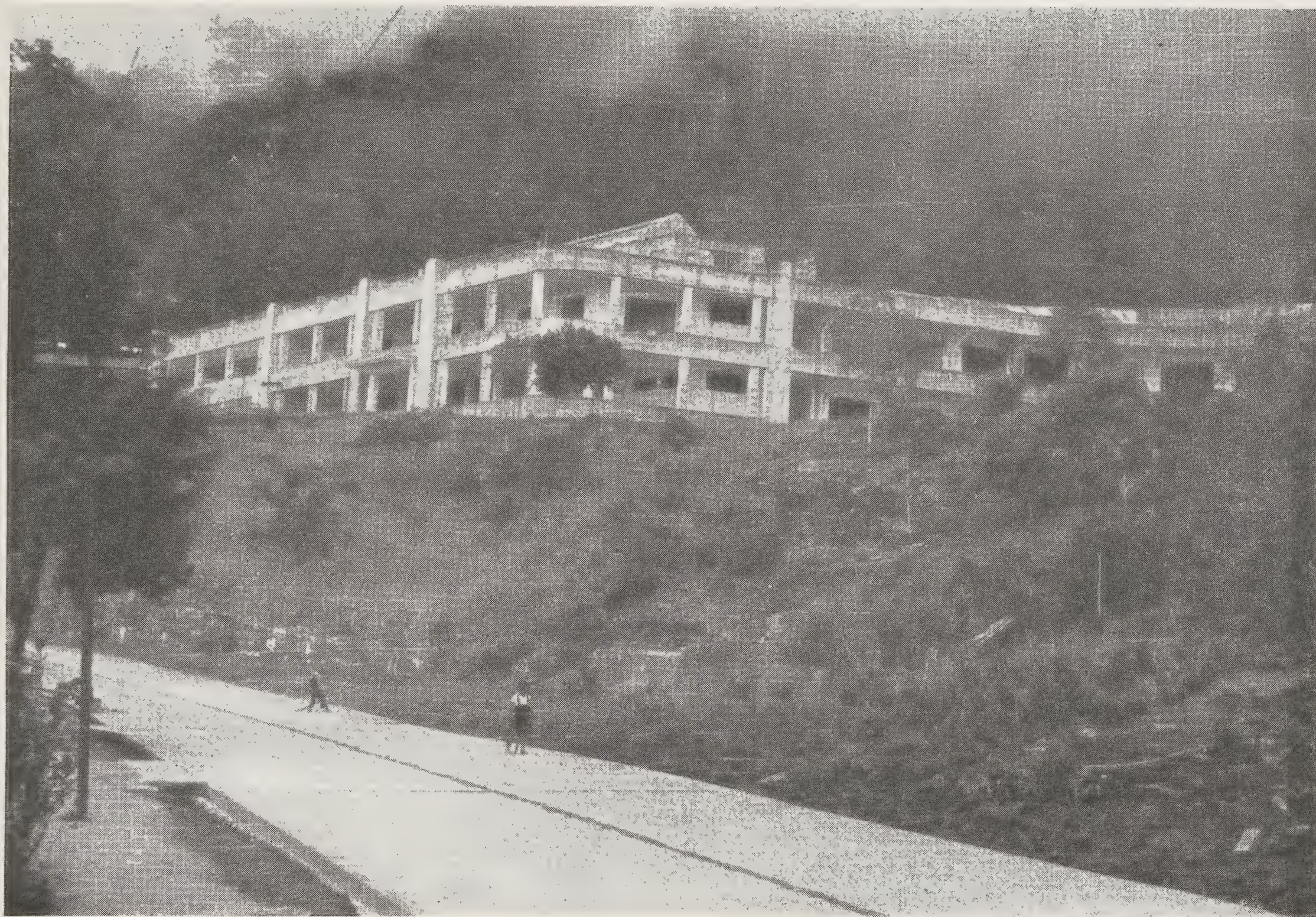
Rancho Grande stands in the center of the northern edge of Venezuela, in a crease of the southern slope of the coastal range. It was the first possible station site that Miss Crane visited, but she "shopped around" in many parts of Venezuela, Colombia and Ecuador, as indicated by the dotted lines.

ONE MORNING last spring the pilot of our small yellow plane pointed through the window at the jungle beneath and shouted in my ear, "Indians would get you there all right!" He wasn't smiling much and probably I wasn't either. A month before, that remark would have sounded like a worn joke to relieve a long flight. Now, after a week in Venezuela's southwest corner, I simply thought how nice it was that the Indians were at least several hundred feet away through lovely, empty air, and not waiting, complete with five-foot arrows, to ambush us in approved thriller fashion. Half-consciously, my ears began to take unashamed interest in the regularity of the motor's roar.

Bad Indians were only the latest unexpected addition to our long list of potential drawbacks of a jungle laboratory. When Dr. Beebe sent

me to South America to find a suitable location for our next expedition's headquarters, the list of things we wanted in our jungle was, like the average Christmas list, longer than that of the things we did not want. Now, after a two months' intensive field course in the art of jungle-hunting, the undesirables had grown to include so many strange items, from tatucos to economical fever, that when I solemnly added the Indians they did not look in the least ridiculous.

In the beginning, the quest for a jungle had seemed relatively simple. Our old friends of the 1942 expedition, the Standard Oil of New Jersey and the Creole Petroleum Corporation, had invited us to come again to Venezuela. We could choose for a base any part of that wonderful country we wished, so long as it lay within the



Only the southwest corner and the full-length front verandahs are finished at Rancho Grande but the completed portion of the immense concrete structure provides plenty of space—and to spare—for the needs of the Tropical Research Station. This view is taken from the highway to Maracay.

national boundaries. Surely that first requirement would be easy to fulfill.

More difficult, but appearing, from the latitude of the Bronx Zoo, not impracticable, were our own scientific needs. Briefly, we wanted a tropical rain forest which was undisturbed by human beings, and yet accessible to supplies and transportation. We preferred a rain forest to a desert, plain or swamp, because in that environment lived and thrived at all seasons the rich variety of beasts and birds and bugs which make the jungle both Mecca and Paradise for us of the Department of Tropical Research. We wished the human population of that forest to be nonexistent not because we are misanthropes, but because the creatures we study show such strongly anti-human traits.

On the other hand, we wanted short supply lines and a healthful, permanent habitat for ourselves; our plans did not include laden donkeys, daily twelve-hour hikes, or chilly tents on barren mountain-tops. Such itinerant expedi-

tions accomplish miracles of exploration and collecting, and they must come first. But we have always preferred to settle in a single favorable spot, organize such essential nuisances as calories, vitamins, drinking water, mosquitoes, bunks and laundry to the point where physical requirements need only subconscious attention, and then concentrate on the wild life outside the laboratory door.

Soon after arriving in Caracas, I explained these characteristics of our dream jungle to one of the Creole Petroleum officials, who was doing his efficient best to help the search along. He made a sound that would have been a snort from anyone less polite, and then rumbled, "All *you* people want is the Waldorf—and Oscar—plopped down in the Lost World!"

After that I refrained from saying that our list of undesirables included over-abundant ticks. It wasn't that we minded ticks in themselves; all are beautiful under a microscope and many are new species. It was just that if, say, four



The jungle south of Lake Maracaibo was promising, with gigantic trees such as this, but there were serious drawbacks—transportation presented some difficulties and it would have been necessary to build a research station almost “from the ground up,” which was impossible during the war.

of us had each to spend thirty minutes every day extracting their jaws from ourselves, fourteen man-hours of scientific work would be lost weekly. That example illustrates the principle underlying all our needs: we wanted a jungle which would yield us, for a given amount of time and money, the most abundant knowledge of how and why animals look and behave as they do. Obviously, if the jungle was very dry or very wet, relatively few creatures would become adapted to such severe conditions, and we would have fewer with which to work. The same would be true if there was much cleared land, with the jungle reduced to small patches huddling in the midst of the sugar and bananas and the corn. Doubtless the Venezuelan version

of a super-market would be close at hand, but the scarcity of wild life would hamper our work even more than would distant drinking water or eternally damp clothing in a richer jungle.

So here I was in the middle of the jungle hunt, flying over the land of the only murderous Indians in Venezuela, and hoping that they did not hold the only piece of forest which would fill our needs. For by that time I was beginning to think that perhaps our friend's remarks about the Waldorf and the Lost World were well deserved, although not quite in the way he meant. Because no one except a biologist would be so choosy about jungles themselves. If you mention the word “jungle” to almost any normal North Americans, from small boys in Kansas to dow-

agers in Manhattan, they will have quite similar mental pictures composed of equal parts trees, monkeys, vines, spiders and orchids all tied together with endless loops of boa constrictor. To them a jungle is a jungle. It is only when you are lucky enough to see a lot of different jungles that you learn there are as many different kinds as there are shoes or cars or fur coats or any other items of sensible everyday life. Also, jungles which are excellent from one zoological viewpoint are poor from another. And so, when I went shopping for a jungle, it turned out to be harder than choosing club-room slipcovers to please twenty members of the Ladies' Aid, or even than buying yourself a hat when you have a cold in the head and need a new permanent.

In the tropics, as in the north, such factors as rainfall, temperature, soil, drainage, altitude, wind-direction and nearness of lakes, mountains and seas all determine whether deserts or plains or forest exist. In addition, human ignorance can swiftly change a forest into arid, barren waste, good for neither farming nor pasture.

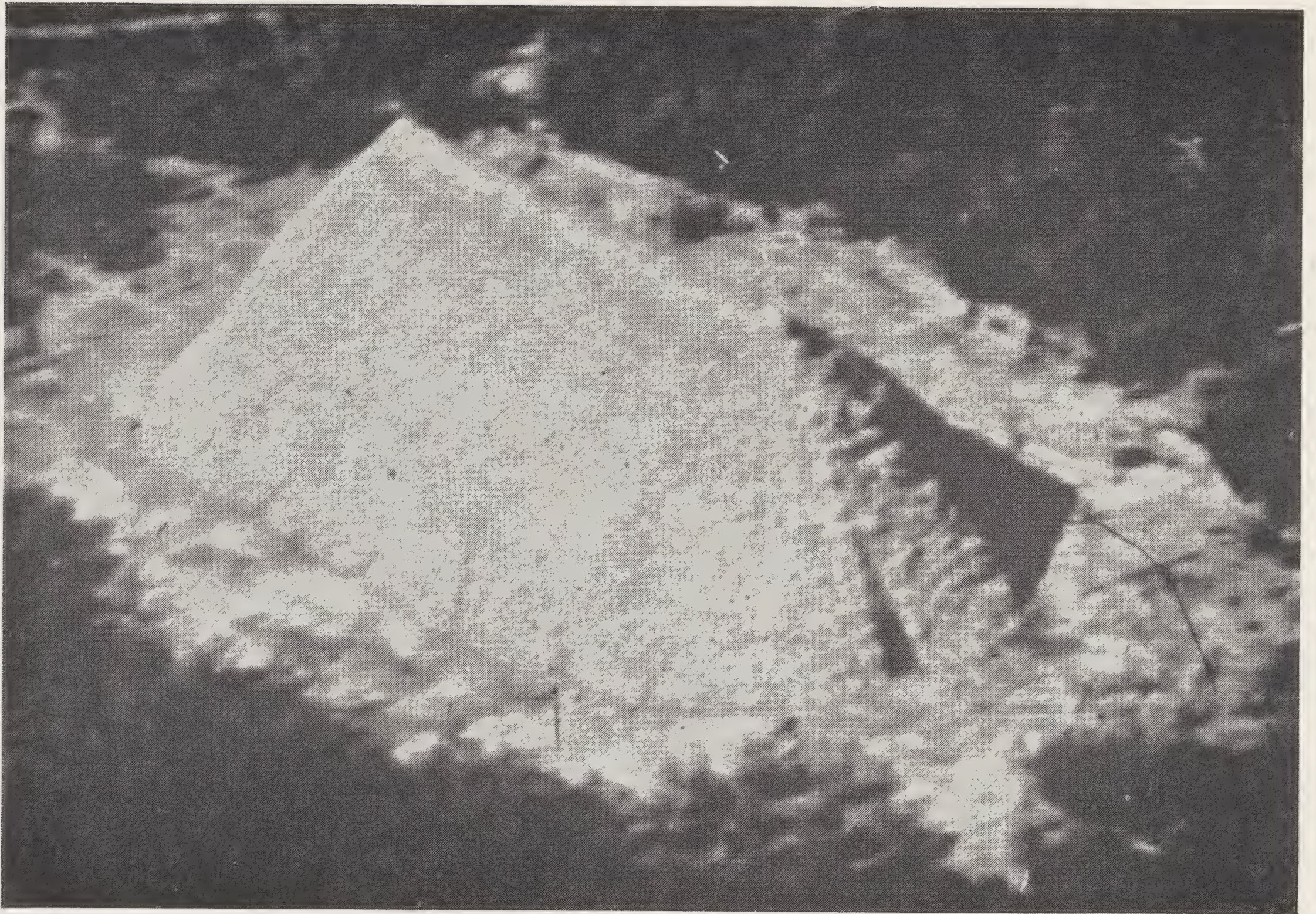
Among the tropical forests, which are loosely termed jungles, the combinations of these same climatic factors decide whether a given tract is formed by giant trees, always green, or smaller trees which lose their leaves during an annual drought, or stilt-legged trees with their feet in eternal swamp, or dwarf bamboo near a mountain top, or any of half a dozen other major jungle types. Those general kinds naturally govern the kind of animals that live there; a swamp-loving tapir would not prowl among the coastal cactus thickets any more than a polar bear would wallow in the Everglades.

The best of all possible jungles for our work is the kind typical of Kartabo in British Guiana, which Dr. Beebe chose as the site of the Zoological Society's first tropical research laboratory. Here is the queen of rain forests, with giant trees forming cathedral aisles, sparse undergrowth, and plentiful yet not excessive moisture through the year. But that kind of jungle is very rare anywhere, and particularly in Venezuela. Instead, the common variety is the seasonal sort we found in 1942 at Caripito, which is dry from January through April, with many trees as bare of leaves as an elm in December, and animal life almost as dormant as in our own winter woods. Later in

the year, large parts of the same forest are soaked or flooded for months at a time. Understandably, fewer creatures are adapted to these violent annual extremes than to the equable conditions found in true rain forest. So we hoped to find a Venezuelan jungle more like the Kartabo region than that of Caripito.

We had heard high praise of the forest to the south of Lake Maracaibo, and thanks to Mr. Watson of the Caribbean Petroleum Company, the wells of which dot the area, I flew from one hospitable camp to another. In between times, I was guest of the Creole Corporation in Maracaibo, through the generous arrangements made by Mr. Proudfit, Dr. Zuloaga and Mr. Owens. From this comfortable base, I studied fiddler crabs and the trips around the lake were planned. Everyone—managers, engineers, geologists, their staffs and all their families—gave unstintingly of everything from companionship and advice to planes, cars and delicious jungle meals. Everywhere the story was the same: my hosts were kindness itself, a house in any camp would have made a perfect laboratory, and the transportation of supplies would have been no great problem. The all-important jungle, however, was uniformly discouraging to zoologists who wished to settle down.

Caribbean's Casigua camp was typical. It sounded ideal, since it lay in wild forest down near the Colombian border, along a low ridge jutting north from the Andes. The land was still uninhabited, save for the rare oil camps and the adjacent Motilone Indians, those very literal savages whose well-guarded lands so effectively closed out civilization on the north and west. Finally, the rainfall up there in the hill country was well distributed through the year. In March, however, I found that the soil drained off moisture so rapidly that the surface dried out completely with every rainless spell, so that wild life appeared even more dormant than in the corresponding season at Caripito. When I stood alone in the forest one morning at dawn, instead of the wild chorus of toucans and parrots, monkeys and guans which a well-regulated jungle puts on as a daily show, there was only a bit of subdued chatter from a band of spider monkeys, far off. In mid-morning or mid-afternoon, the high tide of daylight insect activity, a



Flying over the Motilone Indian country, Miss Crane's plane dropped low over a clearing in the gray-green forest to give her a view of one of the communal huts of these Indian tribes. It was simply a law mound, oval in shape, of palm thatch, with two-foot-high entrance slits around its sides.

pitiful showing of butterflies fluttered in the glades, and an energetic two-hour hunt for jumpers—those most colorful and interesting of spiders—yielded only three of the big-eyed midges. Doubtless in the rainy season creatures would crowd from mudholes and chrysalids, hollow trees and ancient logs, but for year-round work we could surely find a more lively jungle than this.

I had high hopes of the flat delta lands below the camp, through which the Rio Tarra wound down to the Catatumbo. When I flew over this stretch just before landing at Casigua, the jungle, set off by circling skeins of startled egrets, looked perfect, even for our exacting tastes. It was completely green, without the frequent, barren boughs of tall deciduous trees which are among the tell-tale signs of dry-season jungle. Yet it lacked the superabundant palms and bright flashes of water which proclaimed perennial swamp. Both deciduous forest and palm swamp are abundant around the lake and equally bad for our work. Now I found that here in the

lowland, as on the ridges, the land was disappointing. Top loam was almost absent; beneath the crackling leaves was only a whitish sandy clay which looked so poor that the merest window-box gardener would know better than to expect many plants to thrive in it. Insects were scarcer than ever, and I had just begun to think no more discouragement was possible when I crashed into a three-foot hole.

More careful wandering showed the soil riddled with these geological freaks, locally called tatucos. Although no one has been able to give me a literal translation of the name, it must certainly be a strong bit of indigenous profanity. Tatucos are anywhere from two to three feet deep and up to four by six across. A difference in color near the top shows the rainy season level of the water. Sometimes the pits connect with each other and sometimes they are separated by narrow ridges. In places it is easier to follow the ridges, leaping where possible; in others you sort of wade and jump, with an exhausting lack of rhythm, from the middle of one to the midst of

the next. A trail cut through this jungle would closely resemble a plan for a pretzel, and my idea of the perfect nightmare would be to chase a rare butterfly through a patch of tatuco forest.

Those pits warned me to use more caution in judging jungles from the air. The old Spaniards would have envied from their hearts my exploring technique, as they slogged these new-world forests, encased in armor which was vulnerable to mosquitoes and *bête rouges* and yet did not afford the luxury of scratching. Nevertheless, they could never have made my mistake of thinking a tatuco jungle a potential paradise.

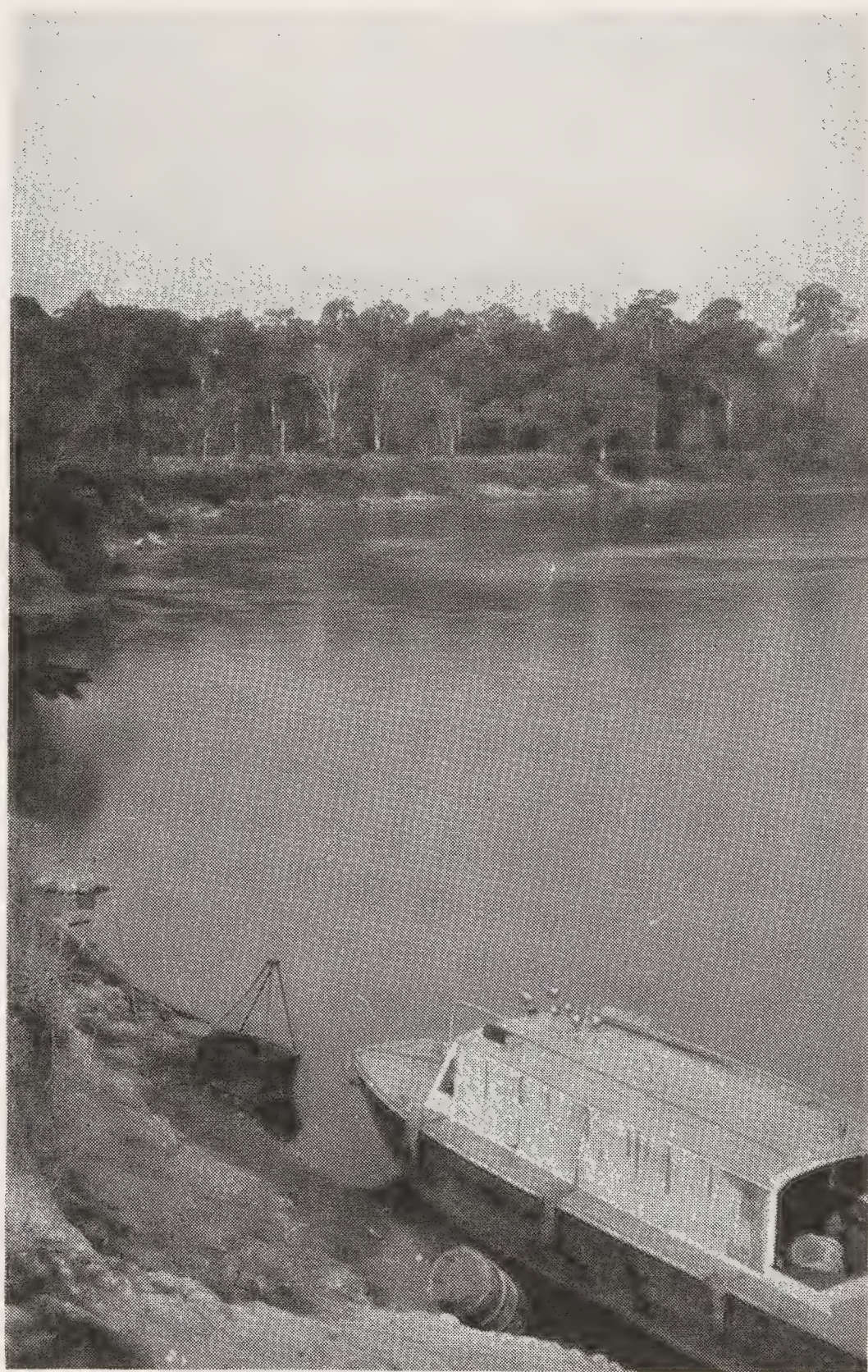
Now that we were flying over the Indian country itself, I remembered the feeling of the afternoon before, as I struggled through the tatuco land. Palm leaves, falling and rattling in the dim stillness, had sounded far too much like stealthy steps. It is wonderful what proximity to wild Indians does to the imagination! Actually, the Motilones have not been known in the Casigua country for more than eight years. Yet, so well founded is their reputation for shooting on sight both Venezuelans and North Americans, that the least rumor of activity is sifted with respect. Too many people have lost friends with arrows through their chests, too many pilots have carried wounded oilmen to dubious recovery in the Maracaibo hospitals, for the Motilones to be a joke. All river launches, and all trucks traveling the Gulf Oil Company's road across the Colombian border, are well screened to guard against arrows. The Motilones appear, from our prejudiced, civilized viewpoint, to have just two graces: first, thanks to the oil which they smear on their bodies, their smell from afar is a useful warning; second, they are not William Tells, since their unpoisoned shafts usually go wide of the mark except when the range is short.

As we flew over their jungle, I hoped alternately that I would at least catch a whiff of a Motilone and that their jungle would prove *not* to be our prospective Eden. All the authorities said we would never be able to settle in their land. Even if we made camp, we would have to cut back the forest for yards and take an armed guard everywhere we went. Most important, we could never follow the same trails day after day, as is our custom, learning the roosting place

of every butterfly and the hidden nests of tinamous and toucans, since the Indians' favorite method is to ambush unwary folk who pass the same way more than once or twice.

All at once we swung west, searching for one of the rare communal houses of the tribe. In the green haze of the jungle appeared a scattering of purple jacaranda trees in bloom, then some towering, golden pui, rising high over the gray-green forest like dandelions on a dew-drenched lawn. Suddenly, hundreds were in sight, with just enough sun to make the yellow shine, while all around the edges of the sky lay the morning mist.

At last we saw a small clearing. We banked steeply, dropped lower, then banked again and swooped so close that we could have counted the fringes on the palms. In the center was an oval, palm-thatched mound. Its only openings were a dozen slits, no more than two feet high, all



Trucks that use the roads and launches on the waterways in the Motilone Indian country are protected by heavy screens against the arrows of the Indians.

at ground level. The roof arched upward just above the slits, so that there were no proper walls. For once, here was a large building in the midst of a jungle, which I did not long to use for a laboratory!

As was to be expected, not a soul was in sight. Everywhere around were the shining golden pui and the violet jacaranda, all set in every shade of misty green, with the deeper, shining green of palms. It was unreal and enchanted, and like nothing so much as the Gingerbread House in the midst of a fairy-tale forest.

Minutes later I realized that the Motilone country, even minus Motilones, would not have been for us. The abundance of the puis and jacarandas, both deciduous trees indicating a strong dry season, were proof sufficient that our rain forest was not here. Although we were still jungle-less, I felt in the main relieved!

Much of the search for a jungle had nothing to do with jungles. There was, for instance, the night on the boat going to Bobures. Bobures is a tiny port in the southeast corner of Lake Maracaibo, which is the outlet for the great sugar plantation, Centrale Venezuela. Thanks to Dr. Pedro Paris and his nephew, Sr. Eugenio Paris, I was to be a guest of their plantation, since excellent jungle was rumored to lie just behind it at the foot of the Andes.

Nothing could have seemed farther from a forest wilderness than the little ferry boat which took me to Bobures. Most of the hundred passengers were typical, cheerful Venezuelans who were on their way home after a visit to their metropolis of Maracaibo. In addition, there were a few Goajira Indian women who, no relation to the Motilones, were amiable souls living to the northeast of Maracaibo. Why they were bound for Bobures, I never learned. They were a brilliant group, in gaudy, lace-trimmed printed gowns and with their faces painted with geometrical dot designs of henna and maroon. I reflected that, after all, their ideas of glamour did not differ so much from our own; it was simply that they put red on their noses as well as their mouths, while long dresses were worn all day long, on jaunts to town, instead of only at dinners and dances. Babies of all colors swarmed everywhere, but goats and kids, chickens, pigs and such lively passengers were confined tidily

to the stern. There was no cabin, so for the all-night ride we sprawled comfortably in deck-chairs, protected from the brisk lake breeze by the upper deck and canvas dodgers. Everyone munched sweets interminably, unbothered by the pervading smell of ancient fish, and beat time to the ship's radio, which blared joropas, news and "Pistol-packin' Mama" with impartial enthusiasm.

Eventually, feeling as though I had been treated to a continuous vaudeville show, I climbed to the open upper deck, where, thanks to the chilliness, there was a great peace. Someone brought me a specially comfortable deck-chair, a blanket, coffee and crackers, and the jolly captain-owner came around for gossip of the States. Once he had visited New York for two weeks and admired, most of all, the Music Hall Rockettes and the Bronx Zoo. Long after he said goodnight and went below, five men around a table endlessly shuffled dominoes beneath a single shaded bulb, hissing soft *carambas* now and then. It was all dream-like and soothing, and the middle of Lake Maracaibo was a pleasant place to spend a night.

Our true rain forest paradise materialized south of Bobures, close against the Andes themselves. Here I rode horseback all one day through a picture-book jungle. Although it was the heart of the dry season, the soil was moist, showers reportedly came often, and yet the country was never flooded during the rains. All of these meteorological conditions were reflected in the plants and animals that lived there.

As we trotted toward it over the last of the plantation's pastures, the jungle rose before us like a wall. Suddenly bird cries swept out to us in a flood of sound so strong we could scarcely disentangle individual notes; guans, tinamous, toucans, antbirds and trogons all mingled indistinguishably, and only a bellbird's note soared above the din. By the time we had threaded our way through the great banana stand which fenced the forest itself, the performance was over, since it was then after nine.

The jungle lived up to its promise. Giant trees loomed within sight of each other, festooned with lianas and epiphytes of every kind. Philodendrons, those favorites of city apartments, climbed in such a lush growth that I thought with pity of our two little striving vines in the

laboratory in the Zoo, earnestly dosed with pellets and watered from a jug. Great brown morphos with bars of electric blue across the forewings were so common I could have caught a dozen. When we stopped to poke in fallen logs, enough assorted crawling things emerged to fill almost any invertebrate zoologist with joy. Orange sunbursts of *Brownia*, a strange flower that blazes from the trunk of its tree, seemed to glow in the greenness. Low paradise flowers grew here and there, lovely orange and purple blooms twice as big as those for which florists at home were asking several dollars. We could walk anywhere we wished, since underbrush was almost lacking and not a tatuco nor a spiny palm was anywhere in sight. By the streambeds we passed the tracks of peccaries and tapirs, jaguars and ocelots, and as we went farther toward the hills, the wonderful roar of howling monkeys grew ever stronger.

For a few hours I succeeded in closing my

mind to the impossibility of establishing our station here. Then reality won out: no permanent base could be built until well after the war's end, in spite of the hospitable offers of help from our friends of the Paris family. To do our work as we wished, we would have to set up house-keeping like our pioneer ancestors, beginning from scratch and with supplies carried by oxcart. We could only hope that this rare patch of rain forest would be saved intact for the future, and that it would not be necessary to sacrifice it to the gods of sugar or cattle or corn. Since it is the private property of the Centrale, there is hope it may continue to be saved.

Another locality which we hoped might prove suitable for our station was the jungle around the Yaracuy River, between Caracas and Maracaibo. Unfortunately, it turned out to be seasonal forest, exceedingly dry during part of the year and apt to be flooded at other seasons. Therefore, it would not be a good place for us,



Looking across Lake Valencia toward the range of mountains in which stands the new station of the Department of Tropical Research. The island-dotted lake itself is in view from the verandahs of the Rancho Grande, beyond the series of low ranges that may be seen in this photograph.

although Mr. and Mrs. Maxudian, who hold the lumbering rights in the region, gave me such a delightful weekend in their camp that I wished we might settle there.

Among other special memories was a handcar ride from the road's end to the sawmill, one ink-black midnight. By the time we had loaded ourselves and our gear on the car, I found myself perched on the very edge of the front, with my fingers clinging tightly to splinters. Most of the way was level, fortunately for my unpracticed balance, and only for a few wild moments were we careening downhill. We certainly were not actually going fast, but there in the blackness it felt as though we were tearing through space on a rocket. When I looked up and saw familiar old Orion overhead, he seemed wholly out of place.

Dry season jungle noises were disappointing. The forest creatures, thirsty to begin with, were doubtless quieted by our own racket, a rhythmic clackety-clack, accented tambourine-fashion by the jingle of the payroll, which banged back and forth in my tin crabbing pail. Once or twice when we clattered over a culvert, there rose the ringing notes of some frog, which died away behind like the lonesome sound of a crossing bell as a train tears past at night.

Smells, on the other hand, were more satisfactory. First there was the pungent whiff of cattle, punctuating the general scent of dusty grass, as we crossed the last pasture before the jungle walls of blackness shut us in. Then for a bit came an osmotic nomansland, between the fields and the forest depths. But soon, as the first of the frogs sang out, we were wrapped in the momentary rich odor of the mudhole where he lived. Then, so suddenly that I almost lost my balance, we met the acrid, invisible comet's tail of a bombardier beetle's path. Next came the faint muskiness of a comfortably distant skunk, only I knew the chances in this country were that the odor came, not from an animal, but from some jungle plant. A little later we swept through a wave of heavy jasmine fragrance, and at last, as a climax to our horizontal *pousse-café* of jungle smells, we stopped in the midst of exciting sawmill scents, where whiffs of fresh mahogany and cedro took the place of pine and oak and poplar in a carpenter's shop at home.

After visiting more than a dozen possible locations, it became evident that Rancho Grande was to be our paradise. I had studied it early in the trip, thanks to our good friends, the Phelps of Caracas. Hunting for our jungle had turned out much as shopping often does when you search for a special gift. You may find it within the first fifteen minutes, but you cannot take it happily until you have shopped all over town in the pouring rain. Nevertheless, when you do come back for your prize, you are delighted with it forever. So for weeks I had thrust from mind the pictures of the great half-finished hotel that stands high on the jungled slopes to the north of Maracay.

Now, after hundreds of miles of travel by plane and foot, dugout canoe, car and horse and train, there was no longer any doubt. Rancho Grande was *It*. The great building with its one finished corner and long verandah would make the most perfect of laboratories. Its setting is, for us, superlative, since it stands in the midst of the national forest reserve which the Venezuelan government has wisely established, guarding this one spot from the sadly common havoc of unplanned clearing.

In spite of its modernistic plan, the building has an old-fashioned personality all its own. With its naked metal beams, half-open rooms, rail-less stairways and eerie air of tropical decay, it should be a perfect haven for every lonesome ghost this side of the tropic of Cancer. But its finished corner should also be a refuge for scientists who love the tropics. From the verandahs, steep slopes, luxuriously jungled, rise on three sides, while to the south spreads a magnificent panorama of low ranges, the island-dotted lake of Valencia, and the whole, sun-splashed valley of Maracay. Late in the day, great clouds of mist come swirling with dramatic speed across the scene, shutting out the greens and blues and gold as quickly as a dark curtain is drawn across a stage. Just as swiftly the ghostly gray sweeps on, and once more you see for many miles.

A half-hour's ride on a cement road joins the Rancho to Maracay, which makes a bread-basket of unheard-of convenience for a jungle expedition. The same road continues past the building for an hour's drive over the pass to the arid coast. Thanks to this little-used highway, the range of



Here, on this broad veranda that will be screened against unwanted insects, the Department of Tropical Research will establish its laboratory in the finished corner of Rancho Grande. In all its history the Department has never before enjoyed laboratory floors of buff and henna tiles!

accessible study material varies from seashore life through cactus-haunting creatures to the secret fauna of the mist forests high up on the mountains.

Such wealth of variety is tempting enough to any ecologist, but even more satisfying is the abundance of life at the very door. On my visit, in the midst of the dry season when all was parched a mile down the road, the jungle about the Rancho was green and fresh. As I prowled along the adjacent trail, small live things scurried through the leaves and fluttered in the light that filtered to the path. Birds, frogs and crickets were all singing in their individual ways, and close by started the evening roar of howlers. The air was full of good ripe jungle smell, and I longed to settle down and go to work.

As I turned regretfully back to the verandah to make sketches and measurements against our possible return, I suddenly had a sort of cheerful premonition. Tables lined the balustrade, and heads bent over microscopes, notebooks and cages full of gaudy caterpillars and exotic-looking frogs. Typewriters clacked and a chair squeaked as someone pushed it back on the smooth hardness of the buff and henna tiles. Then the mirage faded, and only the cool tiles were real. I continued my notes contentedly: Here was our Lost World, rich with all the jungle life we wished; here were stout walls and a good road and accessible supplies; here was a healthy mountain, never flooded, never dry, and with not a Motilone nor tatuco anywhere about. Our castle in the air was found; we would return.



The Oldest Zoological Park In North America

By DR. RAFAEL MARTIN DEL CAMPO
(Done into English by WILLIAM BEEBE)

[In a recent number of the *Annals of the Biological Institute of Mexico* there is a most interesting article by Dr. Rafael Martin del Campo, entitled *El Mas Antiguo Parque Zoologico del America*.¹

I have translated this rather freely into English and have condensed the long and often repetitious quotations from several of the conquistador chroniclers into a shorter and more succinct sequence. W. B.]

WE CAN AFFIRM without fear of being wrong that in olden times, in Tenochtitlan (what is now the city of Mexico), there existed a center of scientific learning, of naturalists and natural history lore, a focus of Aztec men who were well acquainted with the plants and animals of the whole of Mexico and indeed of all Central American countries. The extent and thoroughness of this ancient zoological culture is attested by an abundance of facts; for example, suitable native names for great numbers of plants and animals, names usually descriptive, or containing allusion

to their qualities. So apt and wide-spread were these that many, more or less altered, have been preserved through numerous generations and today are incorporated in the vernacular and even in scientific nomenclature. Such are *xictomatl*, *ocelotl*, *tzapotl* and *quetzal*. Minute and precise descriptions of wild creatures were given by the natives centuries ago to the Spanish conquistadores and recorded by them. Today there still exist manuscripts, ceramics and sculptures with beautifully delineated creatures, sometimes realistic in the extreme, or when conventionalized, showing the intimate knowledge which must always underlie a successful burlesque or convention. When the organisms were most changed it was because of identification with the qualities of the particular gods to which the animals were dedicated.

Another proof of the extent of the naturistic knowledge of the Aztecs of Tenochtitlan was its wide-spread application to industry, food and medicine. Today the ignorant country peons still possess an unexpectedly wide recognition of the medicinal virtues of a host of plants, many of which have been confirmed by pharmacological proof. Finally we know that the Aztecs of this

¹ *Anales del Instituto de Biología de la Universidad Nacional de México*, Tomo XIV, 1943, pp. 635-643.

The headpiece of this article was drawn by George Swanson and all the human and animal figures were copied from Aztec codices and stelae.

fortunate region brought plants and animals from considerable distances in great numbers, and so studied their conditions of life that they continued to live and even to reproduce. So there came to arise in the great city of Tenochtitlan two things wholly new to the American continents, North and South, before the time of Columbus — a Botanical Garden and a Zoological Park.

Even in the days of the Romans there existed sporadic collections of animals for show or usually for exhibitions of combat in the arena, and in Europe in the fifteenth century there were bear pits and game estates. But there was nothing to compare with that astounding Zoological Park of the Emperor Montezuma, which so amazed the Spaniards when first they reached the metropolis of the Aztecs. In an annex of the palace of Tlacatecuhtli were many spacious buildings, each devoted to some class of plants or animals, all in lodgings suited to their wild ways of life, and the animals fed according to their requirements. In addition, careful medical attention was given to ailing creatures, and painstaking care lavished on those which reproduced themselves. These generalities together with many more detailed facts and minutiae have been preserved for us in the journals and chronicles of such reliable eye witnesses as Fray Juan de Torquemada, Diez del Castillo and Don Hernando Cortez himself.

Torquemada considers this mighty Zoo as one of the greatest proofs of the temporal power of the Emperor. Not far from his palace were great buildings and installations filled with dens and cages for ferocious wild beasts, also great aviaries for birds, with corridors supported by numerous columns of jasper, each column of a single stone. These corridors led down to a magnificent garden in which were spacious pools and ponds filled with birds which live in or near water. In one pond was a flock of birds with very long legs and all their bodies and wings scarlet, and the water around was covered with all kinds of ducks. The birds which waded and swam were of so many kinds that, as Cortez says, it seemed as if all the water birds which lived within 200 leagues around had assembled. They showed so many diverse forms and colors that this soldier author was lost in admiration, not having known there were so many and such beautiful birds in the whole world. Cortez tells us that the pools of salt

water were for the sea birds, and those with sweet water for birds of rivers and lakes. All were emptied often, cleaned thoroughly and filled again through pipes, so the water was as clear as a mirror.

In dens of great size with strongly barred cages were collections of lions and tigers (pumas and jaguars), wolves, foxes and many small cats. For 300 leagues in all directions scarcely an animal existed which was not represented in this Zoo, living and often breeding. In a farther hall were royal eagles, goshawks and sparrowhawks, and elsewhere kites and vultures. These all had indoor places protected from the rain and sunny gardens where they could enjoy themselves.

The great *Toto-calli* or Bird House was a beautiful building, with a big patio, all with perches and floored with brilliant tiles like a chess-board, and in length a full 185 yards. Half was roofed, the other half open to the sky. The netting or mesh was of finest reeds or threads for lesser creatures, stout bars for greater. To each species was apportioned its exact food, whatever it ate when at liberty. To one prawns were given, to others fruits of shrubs or trees, corn or smaller grains, worms, flies, lizards, and fish to fish-eaters. Hundreds of pounds of live fish were used daily, which the birds themselves caught in the lagoon. Each day 500 fowls of various kinds were fed to the birds of prey.

Bernal Diaz contributes further details as to the food. To carnivorous mammals were given deer, dead and alive, fowls, little dogs and also the bodies of sacrificed Indians and of criminals. After the sacrifice in the temple the bodies of the victims were cut up with knives of flint, the hearts offered to the idols, the heads hung as trophies, and the remainder fed to the consecrated beasts of prey in the Zoo.

The soldier-author Diaz del Castillo gives us an actual catalogue of the contents of the various houses and exhibits. His list extends from the royal eagles, through large-bodied birds down to tiny creatures painted with many different colors; birds which look like the magpie of Spain called *Quezalas*, and others feathered in five brilliant hues, green, red, yellow, white and blue, of unknown names, and besides all these there were multitudes of beautiful parrots.

One large house was filled with many idols,

fierce gods and with them ravening beasts of prey, to keep them company. Also in the same accursed house were numbers of vipers, and other poisonous snakes which carry their venom in their rattling tails, the worst of all serpents. All these were kept in enormous earthenware containers in which they laid eggs and reared their young. In pools were crocodiles of wonderful size and great iguanas which are good for food, all of these creatures being provided with water or earth according to their requirements, and all kept in separate cages or receptacles.

Each division had its own labels and also its special name, which Torquemada has given us, such as *Toto-calli*, House of the Birds, and *Tecuan-calli*, Home of the Wild Beasts.

The personnel of the Zoo labored in great numbers, each man a specialist in his department, revealing an organization very similar to that of the best modern Zoological Park. For example, three hundred keepers were assigned to the birds. Some cleaned the pools and ponds, others caught insects and fish for food, others fed them, still others kept the birds free from lice and vermin and plucked out broken feathers, some were directed to receive and acclimatize new arrivals. Special men and women looked after nests and eggs, putting some of the latter under broody fowls, and caring for the newly hatched young birds. A considerable number of men did nothing but take care of ailing birds and animals, while a small army of hunters and collectors spent their time searching for new creatures.

The aims of this great zoological establishment set it far apart from any modern Zoo. In no sense was it primarily a public institution, although the Emperor, his Princes and their huge households of six hundred persons upward doubtless derived great pleasure from the collections of strange and beautiful living creatures. As we have seen, many snakes and fierce animals were consecrated to various gods and great numbers were sacrificed to their particular deities. We know that *Tezcatlipoca*, the chief of the gods, was personified by the jaguar, the spotted constellations on whose furry coat symbolized the starry night sky, the dwelling place of this god. Snakes entered into the personality of *Quetzacoatl*, ruler over earthly fertility.

A still less pleasant religious belief was the

field of influence of the god *Xotoil*, twin brother of the snake god, who presided at the birth of all human twins and monstrosities, and to whom the unfortunate albinos, hunchbacks and other human oddities on view in the Zoo, were sacred. However, we are in no position to criticize, when we recall the place at court held only a few generations ago, by dwarfs and deformed jesters.

In the second place, the Zoo of the Aztecs was a source of supply for untold numbers of beautiful feathers needed for the full-length robes of priests and warriors for which this nation was so famous. In this case, actual sacrifice or killing of the birds was not necessary; accurate timing and harmless methods of plucking provided an abundant supply of gorgeous feathers without harm to the original owners.

It was probably as an expression of his magnificence and power that the Zoo must have appealed primarily to Montezuma. Torquemada tells us that the Emperor, walking abroad with his retinue, and suddenly attracted by a hawk or heron flying past, would point to it and demand it. Such was the number and skill of his hunters that in a marvellously short time the individual bird he wished would be captured alive and brought to him.

In conclusion, the tragic end of Montezuma's great Zoological Park was as a victim of a war of conquest which, like the present conflict, was begun under the guise of civilization and redemption. Cortez "civilized" by the destruction of everything which stood for civilization and culture, and he "redeemed" the natives by exterminating or at least enslaving them. Cortez' own words are somewhat as follows: "In order to hurt the Aztecs more, that same day I ordered fire to be put to the great houses on the plaza . . . and all the other houses near by, smaller than the palace but cool and very beautiful, where Montezuma had his enormous collections of birds and animals. I regreted this but I decided to burn them all, because I knew the inhabitants would regret it still more."

[And so came to an end, on the thirteenth of August, 1521, or thereabouts, the splendid Zoological Park of the Aztecs, the first, and one of the greatest ever to be founded on the continents of the New World.]

The POISONOUS SNAKES of the NEW WORLD. Part 4




By CLIFFORD H. POPE

Fellow of the New York Zoological Society; Curator of Reptiles of the Chicago Natural History Museum.

[This article is a portion of a booklet of the same title, previously published by the Zoological Society.]

TEMPERATE SOUTH AMERICA

The temperate region of South America, as explained above, is considered as beginning at the latitude of the mouth of the Rio de la Plata (35° south). Four kinds of poisonous snakes occur in this area, three pit-vipers without a rattle and one coral snake. These can be readily identified from the following descriptions.

URUTU, *Trimeresurus alternatus* (Figure 36). Few snakes are as beautifully marked as the urutu. A double series of dark-edged -shaped blotches extends along the back, the open sides of the blotches facing away from the midline of the back. The brown of the ground color is lighter than that of the blotches. The characteristic pattern is subject to variations: the ends of the blotches may be cut off, or they may even join to form circles. In such cases, the design on the head will help; a light, -shaped mark with the cross bar between the eyes and the branches of the  on the back of the head.

The urutu is by far the largest of the three temperate pit-vipers, reaching an extreme length of sixty-six and a half inches; the average length has not been determined but it would probably be about forty inches. It ranges from the Territory of Rio Negro in Argentina northward over much of southern Brazil, reaching the States of Matto Grosso and Minas Geraes.

MAXIMILIAN'S PIT-VIPER, *Trimeresurus newiedii meridionalis*. The pattern of this variable species strongly suggests that of the fer-de-lance. The ground color is red or brown and the large, dark blotches are narrow along the middle of the

back, wide on the sides. A row of small spots extends along the side, two spots (on either side) being opposite each blotch. The subspecies *meridionalis* ranges widely over Argentina from the State of Buenos Aires and the Territory of La Pampa northward. Other subspecies, one of which is shown in Figure 37, are distributed over southern and eastern Brazil. Maximilian's pit-viper is medium in size, adults measuring two feet or thereabouts; the maximum length is approximately thirty-five inches.

PATAGONIAN PIT-VIPER, *Trimeresurus ammodytoides*. The tip of the snout is distinctly turned up in this species, a characteristic that distinguishes it from the two preceding kinds. The ground color is brown; a row of darker brown or blackish blotches extends down the middle of the back and is paralleled on either side by two rows of spots similar in color. Adults are ordinarily from fifteen to eighteen inches long. This snake occurs only in Argentina where it is found from the Territory of Santa Cruz to the State of Tucumán. It does not inhabit the lowlands of the eastern states. No other poisonous reptile lives as far south.

SOUTHERN CORAL SNAKE, *Macrurus frontalis*. This coral snake is recognized at a glance by its gaudy pattern of red, yellow, and black markings that completely encircle the body to make the belly look essentially like the back. Three black and two yellow rings form a set of five, all equal in width; each set is in turn separated by a wide ring of red. Thus the yellow of the pattern is in contact only with the black, the black only with

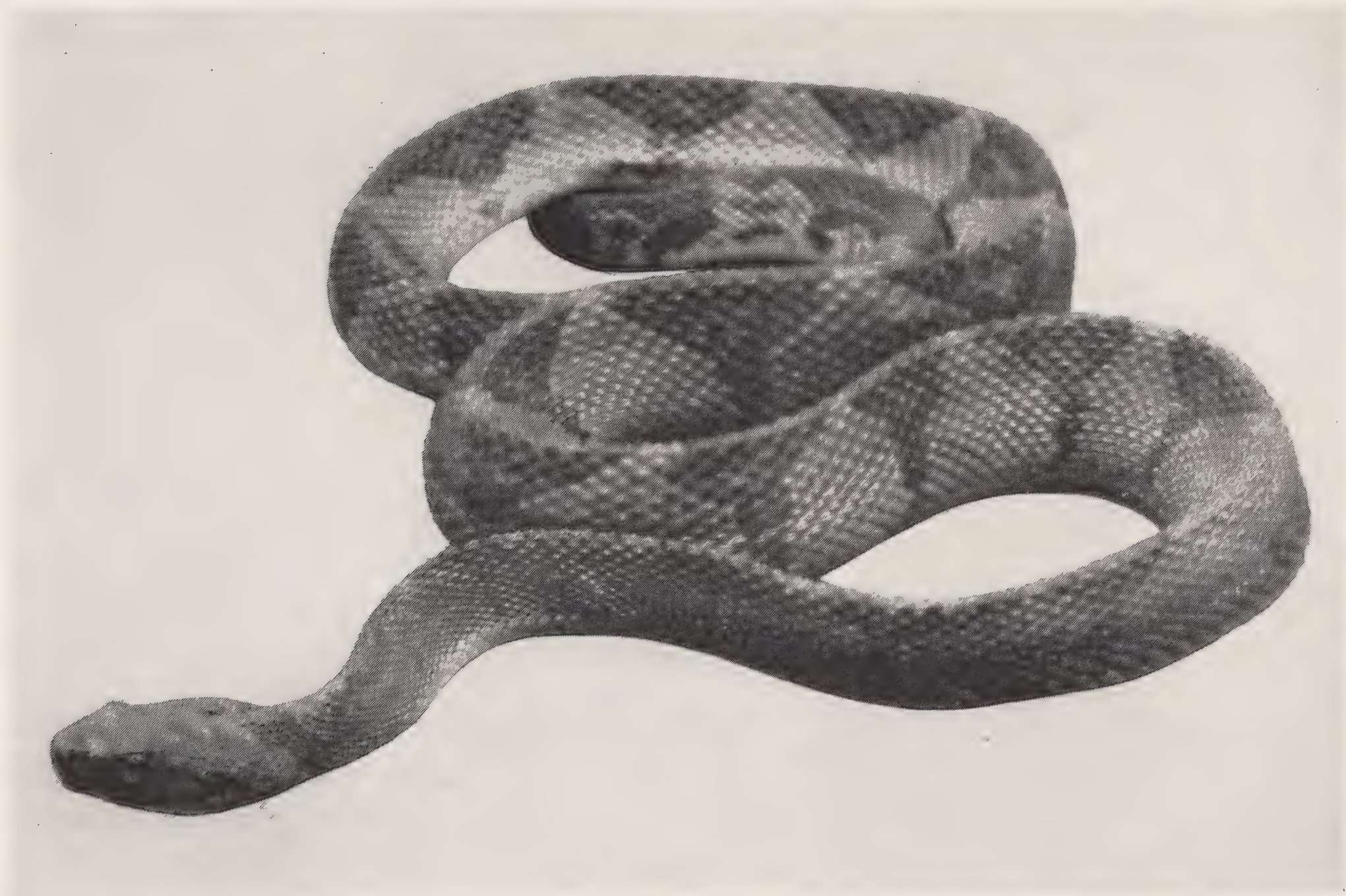


Fig. 31. Bushmaster, *Lachesis muta*. Range: Costa Rica to Brazil. Average length: About 8 feet. Highly dangerous.

the red. The patterns of few if any harmless snakes of Argentina's temperate fauna resemble this one closely enough to cause confusion. The species occurs from southern Brazil to the Territory of Rio Negro, Argentina, and attains a maximum length of forty-seven, an average one of about thirty inches.

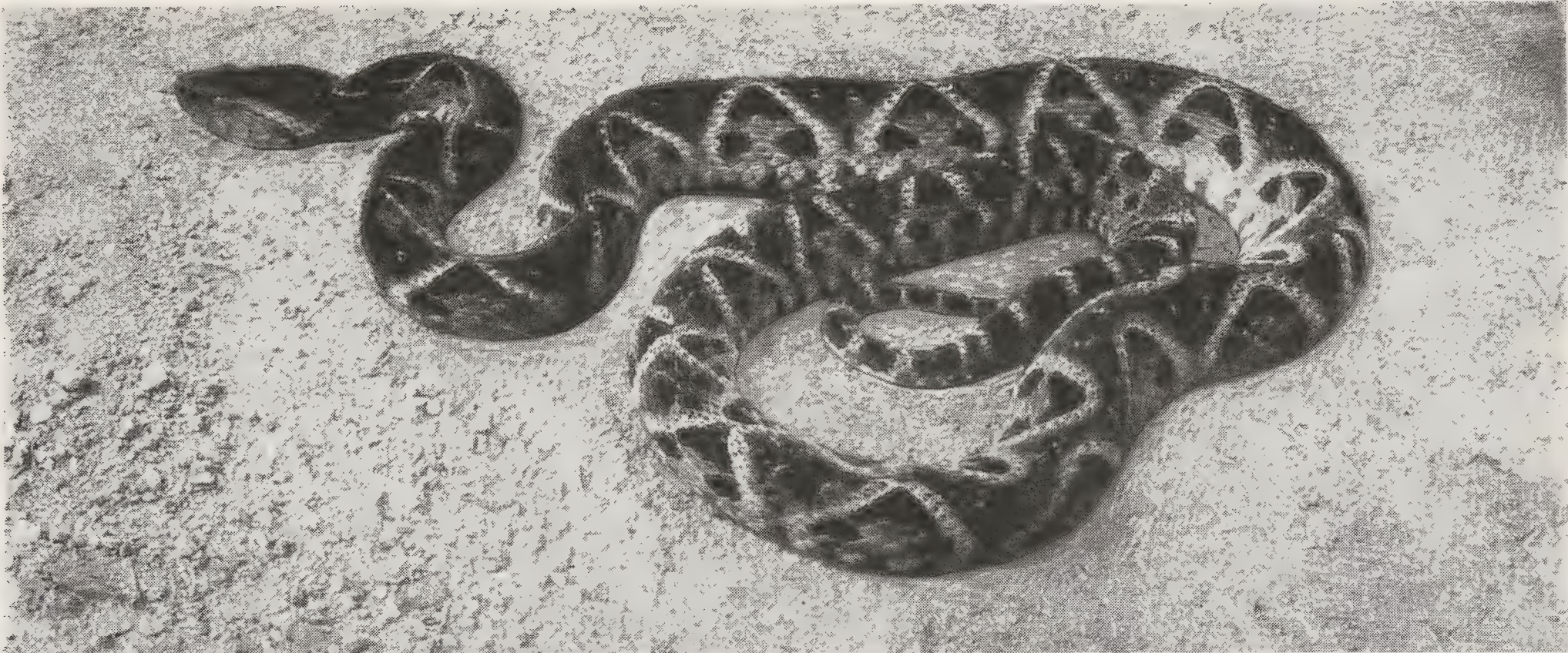
SNAKE POISONING AND ITS TREATMENT

SNAKE-BITE AND SNAKE POISONING

The study of reptile populations is in its infancy so no one can say what percentage of the New World snakes alive today are poisonous; the available information strongly indicates that for every poisonous *individual* there are many harmless ones. It is well known that innocuous *species* greatly outnumber the poisonous ones; in the United States, for example, out of a total of one hundred and twenty-six, only nineteen are poisonous; there is every reason to think that the ratio would be approximately the same in the tropics. This does not mean that harmless snakes everywhere outnumber poisonous ones; certainly there are small areas where the reverse is true.

These comparisons in numbers are made to show how important is the distinction between being bitten by a snake and being poisoned by one. Since most harmless snakes are about as ready to bite as are venomous ones, the chances are always good that a victim who cannot tell one snake from another has been bitten by an innocuous species. Here emphasis is again placed on the importance of a little knowledge of snakes. Many a person merely pricked by the solid, needle-sharp teeth of a harmless species has suffered severely from shock or even from drastic remedial measures. No doubt the universal faith placed in large doses of alcohol is based on cases of bites by non-venomous reptiles "cured" in this time-honored manner. It is now well established that large doses of alcohol do much more harm than good.

The psychological aspect of snake-bite is extremely important. A person with a blind terror of snakes may become so helpless after an unpleasant experience with one that he or she is unable to act quickly enough to meet the requirements of the situation, which might call for agility in securing the culprit, or for steadiness and coolness in finding fang or pit after its



Upper — Fig. 32. Fer-de-lance, *Trimeresurus atrox*. Range: Tropical America. Average length: 5 feet or more (varies from place to place). Highly dangerous.

Lower — Fig. 33. A fer-de-lance from Honduras, 100 inches long.

slaughter. A person may look at a lethal weapon such as a loaded gun without emotion, but

tremble with fear at the sight of a little snake. Even a poisonous reptile is no worse than the



Fig. 34. This newly-born brood of fer-de-lances was made up of more than fifty individuals, each fully developed. Three broods from Honduras contained 64, 65 and 71 young. The offspring of a 6-foot female measured about 12 inches.

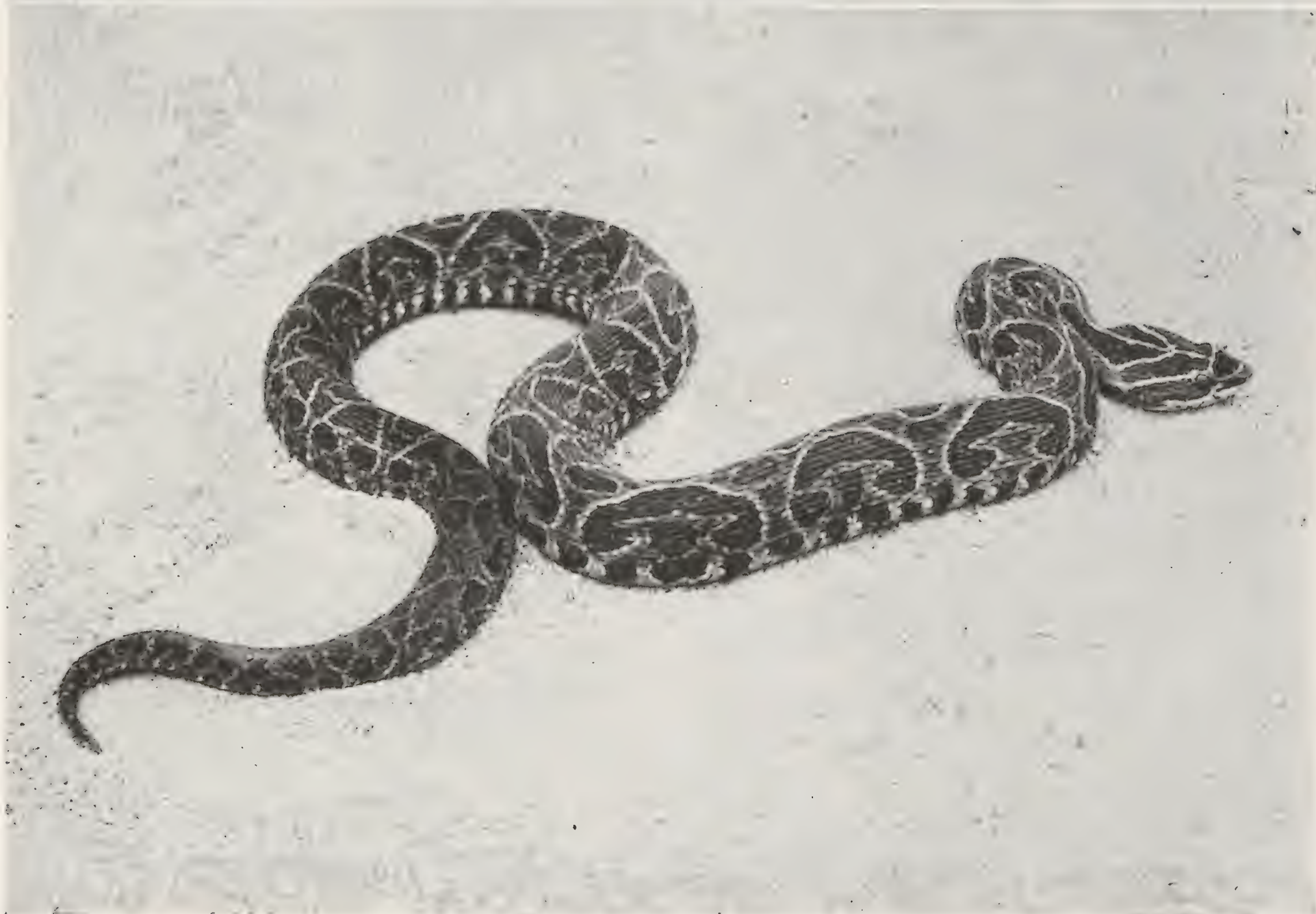
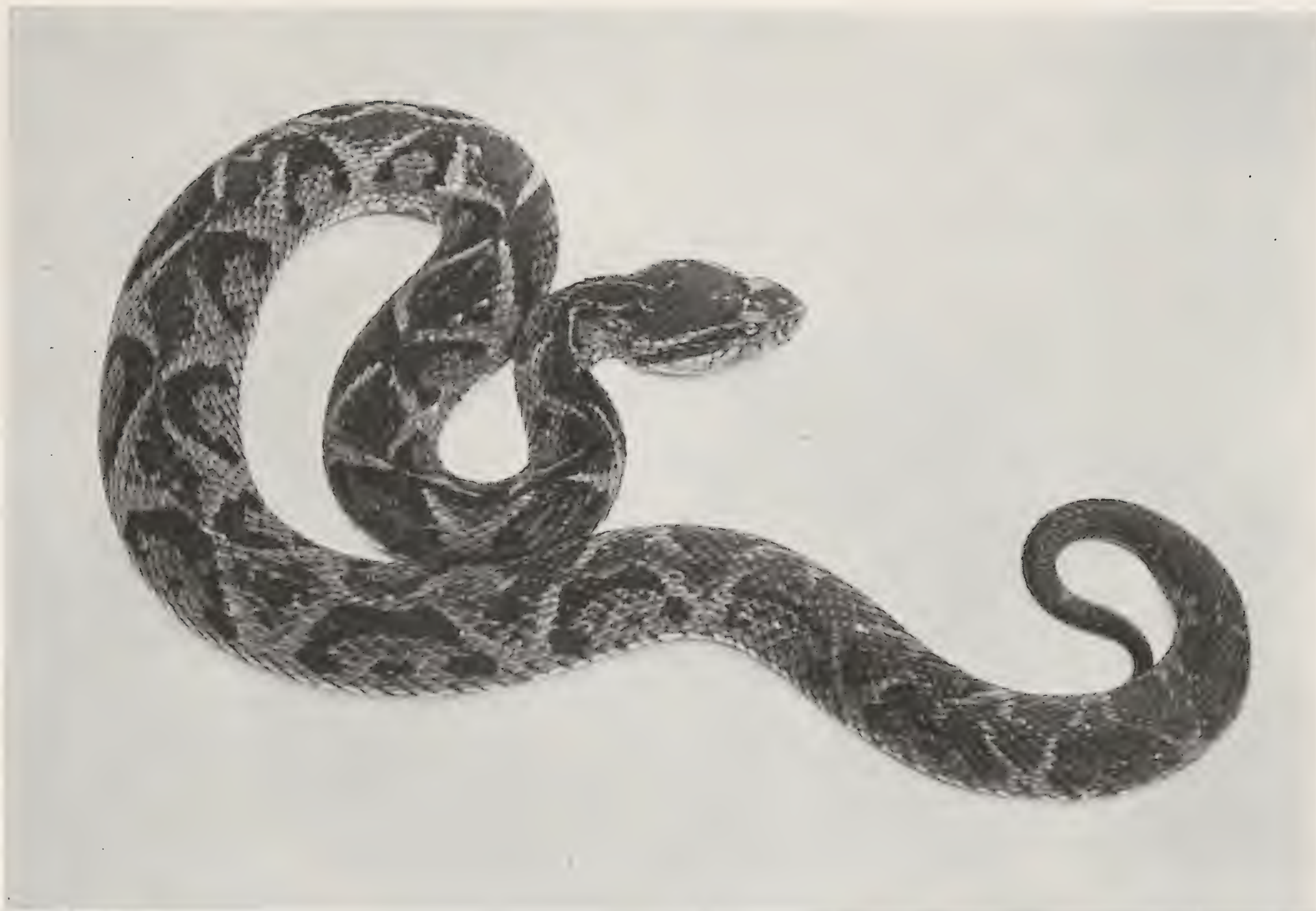
gun, and, if necessary, can be handled quite as safely. The fear of snakes is so deep-rooted in some persons that its eradication is all but impossible; in others the repeated handling of a harmless species rapidly dispels all feeling of dread. Sometimes the stumbling-block quickly turns into a stepping-stone and holding a snake becomes a pleasure. For most of us there is a thrill in the conquest of fear.

It is often said that the bite of a harmless snake differs strikingly in appearance from that of a poisonous one. The difference is not great enough to be relied on, but if certain facts are kept in mind, examination of the bitten place may help a decision; harmless snakes usually have four rows of needle-like teeth in the upper jaw and two in the lower, so a perfect bite would show impressions of all six rows; in poisonous species, the perfect bite would be like the other with the impression of the two outer rows of the upper jaw replaced by fang punctures, one hole on either side. Perfect bites are seldom accom-

plished, but it is safe to say that, if the upper jaw clearly made four parallel rows of tooth-pricks, the snake was harmless.

THE VENOM AND ITS EFFECTS

The venom is modified saliva that not only enables a snake to procure food but helps in its digestion as well; the defensive use of venom is secondary. All reptile venoms are complex proteins that defy full chemical analysis although a great deal is known about their effect on animal and even plant tissues. On this empirical basis, venoms may be divided into two types: one, the haemotoxic or haemorrhagic, causes local congestion and swelling by damaging the blood cells and rupturing capillary walls; the other, the neurotoxic, attacks the sympathetic nerve centers controlling heart and lungs. Unfortunately for purposes of description, most venoms are not pure types but contain haemorrhagic as well as neurotoxic elements and are



Upper — Fig. 35. Jararacussú, *Trimeresurus jararacussu*. A species of Argentina, Paraguay, Bolivia and southern Brazil easily confused with the fer-de-lance. Highly dangerous.

Lower — Fig. 36. Urutu, *Trimeresurus alternatus*. Range: Southern Brazil to Argentina. Average length: About 40 inches. Highly dangerous.

properly classified only as predominantly one or the other. The matter is further complicated;

the poison of the same species may vary noticeably from place to place.



Fig. 37. Maximilian's Pit-viper, *Trimeresurus newwiedii*. Range: Brazil and Argentina. Average length: About 2 feet. Highly dangerous.

"What is the most poisonous snake on earth?" This is a popular reptile question — and none is more annoying. Asking a herpetologist this is like worrying a military man with, "What is the most dangerous gun made?" There are as many answers to the one of these as to the other. One kind of snake may have potent venom but short teeth and a docile nature; or it may even live in uninhabited country and never get a chance to bite a human being; another may have long fangs and big glands but weak venom; another might be neither well equipped nor inclined to inflict injury but frequent a habitat in which bare-legged laborers are forced to work and can scarcely avoid being bitten.

By leaving out certain complicating factors and only considering the three highly important ones it is possible to decide in a general way how dangerous any snake is. The three factors are: the efficiency of the species as a biter or injector

(size and behavior of snake and length and structure of fangs); the amount of venom carried; its potency (measured usually in minimum lethal doses, one "M.L.D." being the smallest amount that will surely kill a given animal). A detailed discussion of the danger rating of New World poisonous snakes would only confuse the layman, but a few generalizations followed by some remarks about the species already discussed should prove helpful.

CORAL SNAKES: Few species have been studied but certainly all are inefficient biters and carry small quantities of a neurotoxic and very potent venom. A coral snake is not dangerous unless trod upon by a bare foot, or handled. Since the common species of the southeastern United States (Figures 1, 25) is well able to kill an adult human being, any kind that equals it in size should be regarded as deadly poisonous.

RATTLESNAKES: All pit-vipers with rattles are

efficient biters, and all carry relatively large amounts of potent venom. The minimum lethal dose for man varies from species to species but any individual more than two feet long should be regarded as deadly. In the "rattlesnake belt" it is well to regard even smaller ones as deadly because of difficulties of identification; certain species of this area have especially toxic poisons. The venom of the tropical rattlesnake or cascabel (Figure 30) is remarkable in being predominantly neurotoxic instead of haemotoxic as in the other species of rattlesnakes investigated. The bite of this reptile is especially dangerous.

OTHER PIT-VIPERS: This category includes the numerous rattle-less pit-vipers of the genus

Trimeresurus (or *Bothrops*), an almost entirely tropical group; the bushmaster (Figure 31); the two aquatic moccasins (Figures 23, 24); and the copperhead (Figures 21, 22). Broad generalizations cannot be made, the venoms of few of the tropical species having been investigated, but it is safe, as in the case of rattlesnakes, to regard all individuals more than two feet long as deadly, and to treat the others with great respect. In justice to the copperhead, it must be stated that its bite does not cause death in adult human beings unless complications develop. The pit-vipers, like the rattlesnakes, have a venom that is primarily haemotoxic.

(To be concluded)

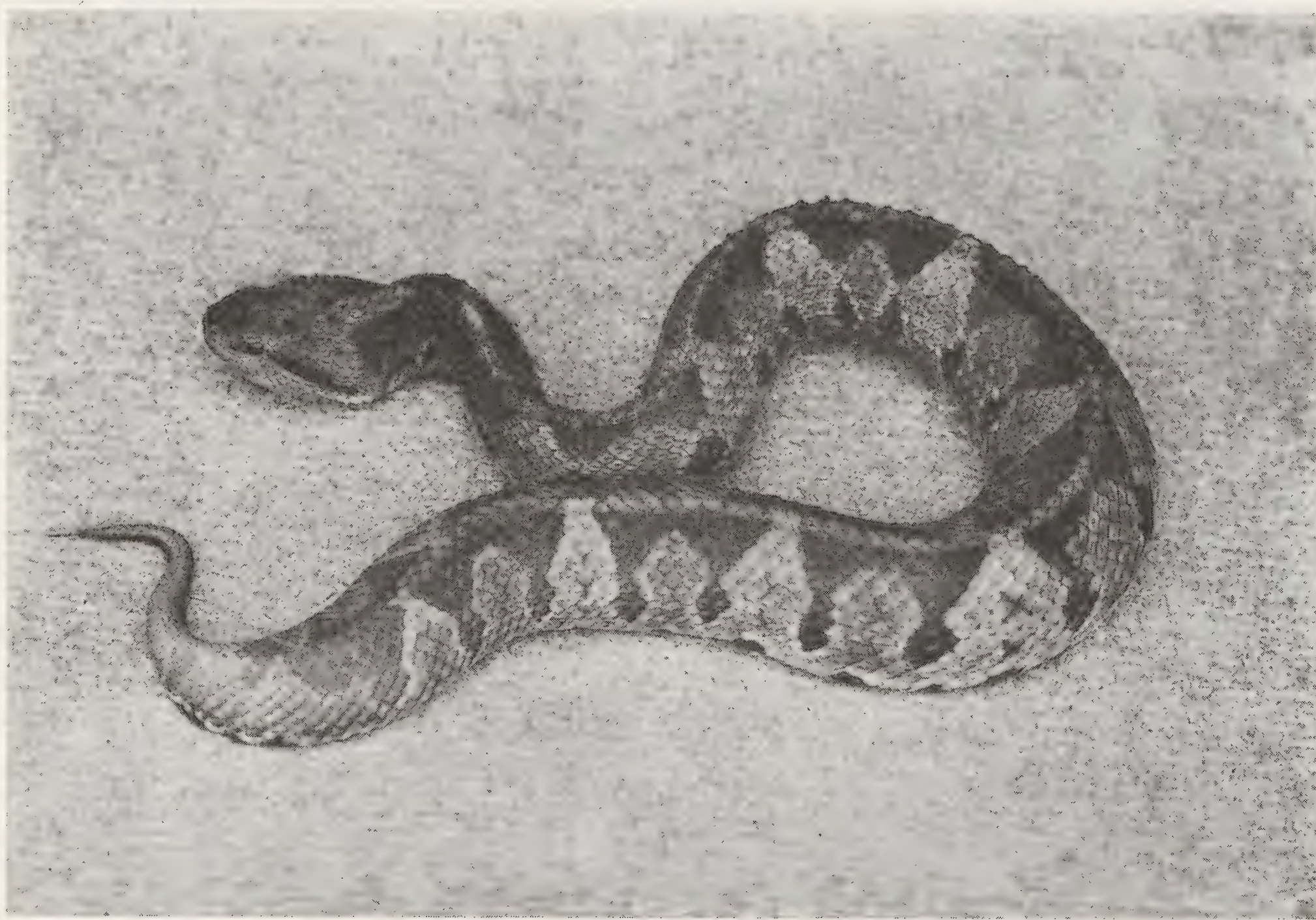


Fig. 38. Jumping Pit-viper, *Trimeresurus nummifer*. The strike of this bad-tempered snake is so vigorous that the whole body may be carried forward by it. The characteristic pattern and thick body help in identification. The species lives in Central America and tropical Mexico and its maximum length is 31½ inches.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

"PETE" IS THE DEAN NOW

The place of honor as the Bronx Zoo's oldest inhabitant is now held by "Pete," the Nile hippopotamus, born in Central Park Menagerie on July 13, 1903, and received here on July 14, 1906.

Pete acquired seniority on November 10, 1944, when "Old Jenny," an European pelican and up to then the oldest living specimen in the Zoo, succumbed to the excitement of being transferred to winter quarters after a summer of freedom on Cope Lake. Old Jenny was purchased from the firm of Louis Ruhe on April 20, 1904. Throughout her long life here she showed no signs of illness and evidently suffered, at the end, only from the inevitable encroachments of old age. Her established record with us of 40 years, 6 months and 21 days is exceeded, as far as we know, by only two others: 48 years, 9 months; and 41 years, 5 months, both in the famous old Zoo of Rotterdam.

Our hippopotamus seems likely to make an outstanding record, as the greatest longevity so far reported for the species is 41 years and Pete is well into his 42nd year with every indication of going on forever. As a matter of fact, all of the best records were made by females, so Pete has not only honored his sex but may go on to do something really good!—L. S. C.

NEW MEMBERS OF THE SOCIETY

New Members of the Society since the last issue of this magazine are:

<i>Annual</i>	
Margaret T. Bohmert, Ph.D.	Benjamin Levi
Pearl B. Boli	Alan E. Leviton
Florence A. Campbell	Mrs. William F. MacDermott
H. Huber Clark	Richard Dudley Miller
Ferdinand Cochu	William Fellowes Morgan, Jr.
Rodney B. Cole	Maxim Smith
Charles Copeland	Dr. Charles B. Streck
Mrs. Cheever Cowdin	John Swope
Charles Crompton	Sherman Thursby
George F. Fischer	Miss Nell Wardrop
Carl Edward Krummel	M. J. Weisfeldt
Raymond B. Haynes	Bernard Whitefield
Mrs. O. J. Lane	

A KANGAROO RECORD

On January 6, 1945, an aged Great Gray Kangaroo, coaxed by Keeper James Rimmer into liv-

ing well beyond her normal time, lay down and breathed her last. We knew she was very old, since she was born here in 1927, but it was not until the records were searched that we realized a record may have been established. The oldest published record known for a Kangaroo of any species was established by a Red Kangaroo that lived in the National Zoological Park, Washington, D. C., for 16 years, 4 months and 3 days. Our Great Gray has certainly exceeded seventeen years, although by just how many months we shall never know, since no exact birth day is recorded.—L. S. C.

PUBLICATIONS OF INTEREST

BIRDS OF THE SOUTHWEST PACIFIC. By Ernst Mayr. The Macmillan Company, New York, 1945, pp. I-XIX—316. Three colored plates, 16 line cuts and map in end papers. Price \$3.75.

Of all the questions that daily flood the staffs of the zoological institutions of this country, none can have caused more general embarrassment than the avalanche of requests for books about the animal life of the South Pacific, following the great increase of our armed forces in that area. Demands from Americans in Australia have actually given us pleasure, and we have been happy to recommend Cayley's excellent handbook, "What Bird Is That?" But soldiers, sailors and marines in the islands have just had to do without, for there has been no accessible publication that would help them.

"Birds of the Southwest Pacific" fills a gap that stretched from Tonga to Palau. It is a good book, done by the leading authority on the birds of the area. It will be a boon to many naturalists now in the South Pacific and to the hordes of bird-minded travellers who will swarm down on the islands once they have been cleared of the hateful invaders. Just how it will affect the service man is an open question. Dr. Mayr has reduced keys and descriptions to their simplest form but the plain fact remains that the speciation of birds is not a simple matter. It is there that the difficulty lies.—L. S. C.

590.673
A59

ANIMAL KINGDOM



BULLETIN, PUBLISHED BY
NEW YORK ZOOLOGICAL SOCIETY

WS OF OUR TIGER AND LION CUBS, by *Lee S. Crandall* • A SOLDIER WRITES ABOUT
CIFIC BIRDS, by *Major R. T. Brice* • IBIS IN THE ST. LOUIS ZOO, by *H. Ettinger* • NOTES

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York 20, N. Y.

PRESIDENT

Fairfield Osborn

FIRST VICE-PRESIDENT

Alfred Ely

SECOND VICE-PRESIDENT

Laurance S. Rockefeller

SECRETARY

Harold J. O'Connell

TREASURER

Cornelius R. Agnew

EXECUTIVE COMMITTEE

Fairfield Osborn, *Chairman*

Cornelius R. Agnew
Alfred Ely
De Forest Grant

Warren Kinney
William De Forest Manice

David H. McAlpin
Robert Moses

Harold J. O'Connell
Laurance S. Rockefeller
J. Watson Webb

BOARD OF TRUSTEES

Class of 1946

George Gordon Battle
George C. Clark
F. Trubee Davison

Jay Downer
Robert I. Gannon

Robert Gordon McKay
Fairfield Osborn

Laurance S. Rockefeller
John M. Schiff
Frederic C. Walcott

Class of 1947

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez

De Forest Grant
Eugene Holman
Warren Kinney

Henry R. Luce
William De Forest Manice
Harold J. O'Connell

Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1948

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely

Marshall Field
Childs Frick
Archer M. Huntington

David H. McAlpin
John H. H. Phipps

Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Ex-officio, The City of New York

The Mayor, Hon. Fiorello H. LaGuardia

Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

John Tee-Van *Executive Secretary*

Jean Delacour *Technical Adviser*

Sam Dunton *Photographer*

William Bridges *Editor & Curator, Publications*

Edward Kearney *Manager, Facilities Dept.*

Sanford Miles *Comptroller*

Quentin Melling Schubert, *Superintendent, Construction and Maintenance*

ZOOLOGICAL PARK

Lee S. Crandall . *General Curator & Curator of Birds*

Leonard J. Goss *Veterinarian*

Brayton Eddy *Curator of Insects*

John Tee-Van *Associate, Reptiles*

Grace Davall *Assistant to General Curator*

W. Reid Blair *Director Emeritus*

William Beebe *Honorary Curator, Birds*

AQUARIUM

Christopher W. Coates *Curator and Aquarist*

C. M. Breder, Jr. . *Research Associate in Ichthyology*

Ross F. Nigrelli *Pathologist*

George M. Smith . *Research Associate in Pathology*

Myron Gordon *Assistant Curator*

Homer W. Smith . *Research Associate in Physiology*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*

Jocelyn Crane *Research Zoologist*

Henry Fleming *Entomologist*

George Swanson *Staff Artist*

Associates

William K. Gregory
John Tee-Van

Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

VOL. XLVIII

APRIL 4, 1945

No. 2

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York 20, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York 60, N. Y. Title registered with United States Patent Office.

Subscription, \$1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

Our New Department of Insects

Much has been written by philosophers as well as by naturalists about the similarity of some of the patterns of human society and those of bees, ants and termites. Many of these analogies may appear far-fetched — and yet, strangely enough, there are some startling likenesses in the social patterns of mankind and insects.

It is not because of these, however, that the Zoological Society is about to enter a new field of activity through the establishment of a Department of Insects. There are far more tangible reasons for doing so. Insects are much the most numerous of all living things on the face of this earth. While many kinds are harmful, others are not only beneficial but actually necessary to our existence. All in all, they affect man, for example, in health and in agriculture, more directly than any other forms of animal life. It is timely that we as a zoological society, having dealt with mammals, birds, reptiles and aquatic life, should now, as a part of our development plan for the future, establish a department for the exhibition and study of insects. Broad objectives are in mind for this new field of activity, including the eventual establishment of a major building in the zoo for the display of living collections of many varieties, native types as well as those from the sub-tropical and tropical regions of the earth. It is our aim that this department will become a center of study as well as of public information concerning this fascinating and important field of zoology.

Fairfield Osborn

APR 9 '45

IN THIS ISSUE

Nursery Class of 1944 Has Its Picture Taken	Sam Dunton	COVER
News from the Nursery	Lee S. Crandall	27
Birds Among the Coconuts	Major Richard T. Brice	32
The Poisonous Snakes of the New World. Part 5	Clifford H. Pope	44
It Died a Scarlet Ibis	Hattie Ettinger	48
The Humor and Myth of Linnaeus	William Beebe	51
Behind the Scenes: News and Notes		52



In the interests of accuracy, we must admit that Mrs. Fred Martini does not attempt to feed all three or even two of her charges at one time, as a general rule. One baby and one bottle are all she can handle.

NEWS from the NURSERY

By LEE S. CRANDALL

BABIES in a Zoo aren't always planned, but when they are the plans are supposed to be made by the animal department. This time it was a little different. Animal men arranged the details, it is true, but the main idea stemmed from the Department of Publications, doubling as Publicity, which conceived the remarkable idea that if we only had a mixed family of both Tigers and Lions, it really could do something.

This idea was thought, at first, to be merely amusing, but very soon we began to realize that it should be taken more seriously. We had a pair of Tigers and a pair of Lions. What were we waiting for?

Well, we were waiting for a number of reasons. Prince, our male Tiger, had never been physically sound and was definitely waning. We were hoping that the coming of spring might improve his condition. Lions, within the last year, have been so plentiful that surplus young animals were not disposable, so that rearing them led only to unpleasant difficulties. On the other hand, our pair of Lions, Bruno and Lady, are superb individuals capable of producing outstanding young, but Bruno especially is approaching old age. It might be advisable to attempt rearing something from them before it was too late. Lady is an unusually nervous animal and we knew from bitter experience that she would not rear her cubs. Mrs. Fred Martini, the wife of the Lion House Keeper, who had been so successful with our three little Tigers last year, was our only hope. And if we were going to try two Lions, we might as well advance the Tigers a little and give the Department of Publications its chance.

In the first weeks of September, shift-doors were pulled and two pairs of happy animals were

Tiger and Lion cubs differ in temperament just as much as human babies do—and they keep their baby characteristics after they become adults, too.

soon romping in the breeding cages. For some weeks all went well and then we noticed that the two females were becoming more deliberate in their play and were spending more time in the sleeping boxes. The males were coaxed back into their own quarters and the now expectant mothers were left to themselves.

The gestation period for both Lions and Tigers is about one hundred days, so that close approximation of the date of arrival of the cubs was possible, if not very probable. On Sunday, December 17, after just 103 days, hurried telephone calls from Head Keeper Schilling cut short the day of rest for the Veterinarian and the General Curator. Keeper Martini had detected infant squalls emanating from Jenny's inside box—Jenny being our Tigress. After waiting several hours in the hope that another small voice might be added to the one we could hear, we decided that the time for investigation had come.

Jenny would not leave the box for the fine piece of horse meat offered by her Keeper, but he finally tricked her by skillful manipulation of the amazing array of ropes that operates the numerous cage doors. This time we had planned no elaborate use of scented gloves, as we did when the three cubs were born last year. We meant to take whatever we found, for we knew that Jenny would lose her cubs if we left them with her but that Mrs. Martini would rear them if they were viable.

As soon as Jenny had been excluded, Fred entered the box and found little Ranee, cold,

hungry and squalling lustily. Dr. Goss pronounced her sound; so, carefully wrapping her in heated towels, we rushed her to Mrs. Martini's apartment. Here she was welcomed joyfully, weighed, measured and placed on a heating pad while her milk was warming. She was found to weigh 2 pounds and 12 ounces, an ounce more than her older sister Dacca at birth, and measured 20 inches from tip to tip, as did all three of the previous litter. As soon as Ranee was thoroughly warmed, she took $1\frac{3}{4}$ ounces of the standard mixture of one part evaporated milk and two parts water, from a rubber nipple. Set down on the floor, she actually stood up and even walked a step or two, using her hind legs with an ability the first lot did not acquire for weeks.

For the next day or two we listened hopefully at Jenny's cage, without reward. On the third day we again entered the nest, just to be sure. It was empty. Little Ranee was a singleton.

Leaving Mrs. Martini happily nursing her new charge, we began to concentrate on Lady. She obviously meant to oblige, and soon. It happened just as we were about to go to lunch, on December 22, after a period of 106 days. It seemed incredible that our little scheme should have come off to such perfection, but as we gathered at Lady's cage there was no denying that it was true. And more than one, this time.

We knew Lady's temper too well and promptly closed the building. After waiting as long as we dared, Fred began his campaign to coax Lady out. Far more nervous and reluctant than Jenny, she drew out the struggle for hours but it culminated successfully. Hastily, Fred entered the box and passed out three cold, wet and miserable cubs. Lady had never mothered them for an instant and one, a male, had somehow been so injured that he could not be saved. The two bedraggled little females were soon receiving the attentions of Mrs. Martini. She had been studying an atlas in a search for possible names for the cubs and was ready with two suggestions — Limpopo and Zambesi. Since it has become a tradition that Mrs. Martini is entitled to bestow names on the animals she rears for us, Limpopo and Zambesi it was — although somehow the cubs looked more like two out-sized, half-drowned kittens than like potential lionesses with such imposing names. Both cubs measured $21\frac{1}{2}$ inches

from tip to tip, but while Limpopo weighed 2 pounds 12 ounces, Zambesi made an even 3 pounds.

Miserable as they looked when we left them, morning brought a different story. We could hear them bawling even before Mrs. Martini opened the door of her apartment, and when we looked into their box, what a change! Their tawny coats bright and fluffy, their little bellies bulging with milk, they were crawling lustily over, under and around each other. It turned out that Mrs. Martini, despairing of gentler measures, had doused the cubs thoroughly in hot suds, rinsed them carefully and had put them in the oven to dry! It worked perfectly, but probably should not be noted as approved technique.

It was a joyful sight, but now came the time for final fruition of our plan. Carefully lifting little Ranee from her box, Mrs. Martini put her down between the Lions. Nothing would happen, of course — no reactions could be expected from these tiny, sightless creatures. But if eyes were not functioning, noses were, and Ranee began at once to sneeze and cough. At least, that is what we thought she was doing until we realized that she was really spitting in baby Tiger's fury! And when one of the Lion cubs pushed clumsily against her, Ranee made a fumbling effort to strike with spreading claws. Limpopo and Zambesi were indifferent to the stranger and swarmed over her with as much enthusiasm as they showed for each other. It was a small matter, yet fully indicative of distinctions that became more definite as the cubs grew older.

Within an hour Ranee had become accustomed to her foster sisters and all three were curled up together, calmly sleeping. This acceptance quickly developed into strong attachment, at least on the part of Ranee, and she still cries pitifully if separated from them.

Both Lions opened one eye on the fifth day and the other on the next. Ranee opened one eye on the fifteenth day and both were fully open the one following. All grew rapidly and seemed to be more vigorous than average cubs. At two months weights were as follows: Ranee, 11 pounds 12 ounces; Limpopo, 11 pounds 4 ounces; Zambesi, 11 pounds 4 ounces.

Close observation of these cubs, from the day of their birth to the present age of two months



The laundry problem is a big one when there are three babies in the house. This is one week's supply.



A cooking utensil makes a practical receptacle for the cubs at weighing time—they can't scratch it.

Lion cubs are more active than Tigers, and delight in climbing, especially for a reward of milk.



Hand-reared and friendly though they are, our three young Tigers are creatures of the jungle and revert to jungle ways at any moment. This great, stalking cat is little Rajpur on the prowl in the big outdoor cage of the Lion House. At the time the photograph was made by H. Huber Clark, a Member of the Zoological Society, Rajpur weighed about 100 pounds. and was only about 7 months old.

(at the time of writing), has been illuminating. When we noted the temperamental differences between Rajpur, Raniganj and Dacca, and reported them in *ANIMAL KINGDOM* in the July-August issue of last year, we seemed just a little premature. Actually, however, these three older cubs are still entirely in character and have developed exactly as we rather dubiously suggested they might.

Now we can say, with more confidence, that little Ranee is a fourth Tiger personality, quite distinct from any of the others. Mrs. Martini still likes to call Dacca "sweet," but I prefer to call her mischievous. I yield, though, for Ranee

— I admit that she is definitely sweet. She is also gentle, affectionate and shy, though not timid. She is strongly attached to the Lion cubs but she is rather like a small girl, tagging after two large and rather tough sisters. When she catches up with them she is soundly smacked for her trouble. But at the first opportunity she is off on a quest for more punishment.

Personality curves are as flat in Lion cubs as they are steep in Tigers. Rough, tough and active, young Lions fear nothing and as soon as their bleary baby eyes function sufficiently, will promptly bite the proffered hand of friendship. Their soft tawny coats and faint dark spots seem

exactly alike and if one did not have a pinch more black on its tail-tip than the other, I am sure I could not distinguish them physically. And except that one is a trifle more savage than the other, I can detect no temperamental difference. What is more, I think any normal Lion cub would check with them, age for age.

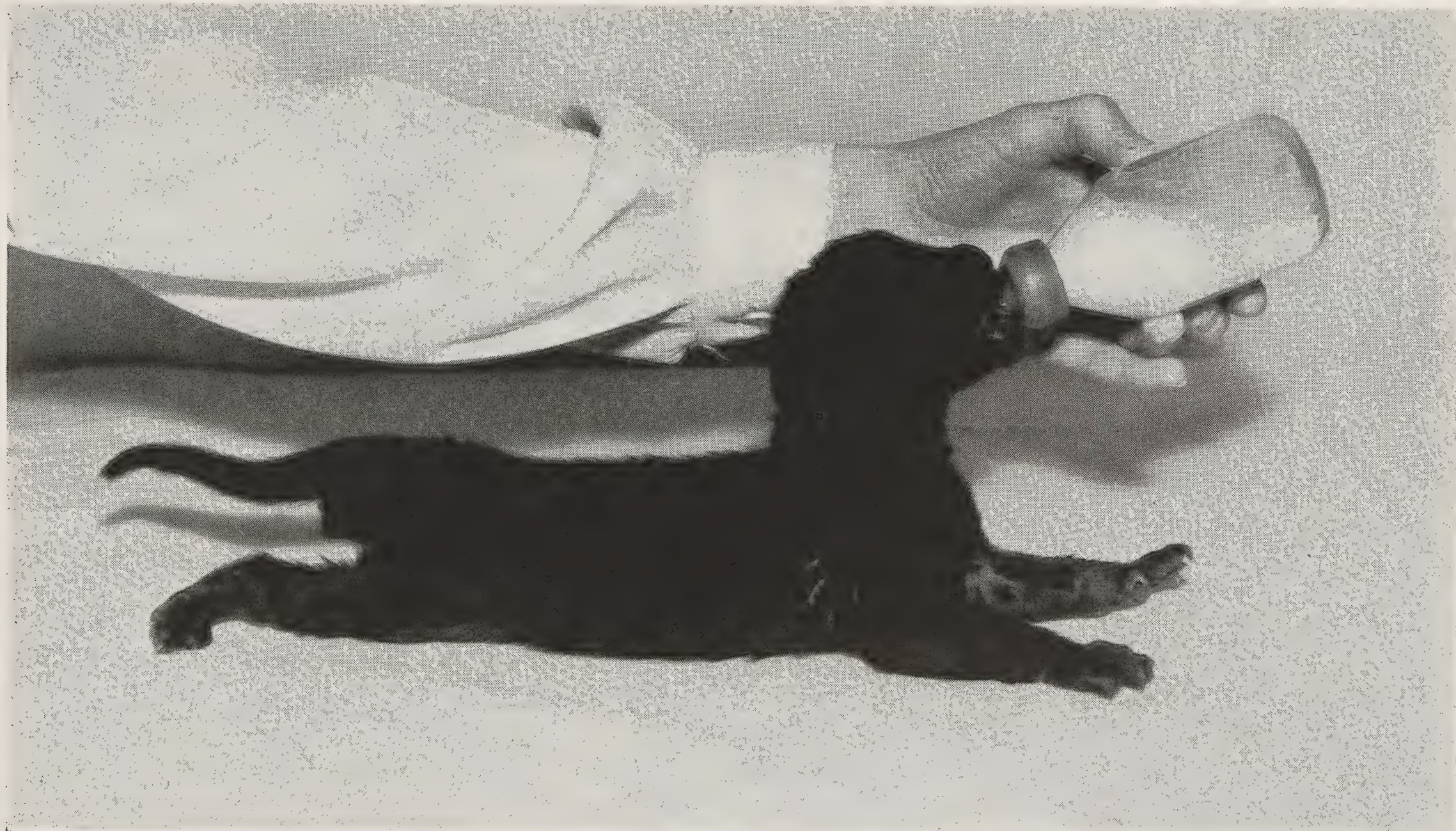
Mrs. Martini insists that these small fiends are "sweet," although I notice she is always at hand for frequent rescues of the persistent Ranee. So now the Publication Department has what it wanted — though just how long we can keep the family tractable for photographers and reporters remains to be seen!

And a Black Leopard, Too

TWO LION CUBS and a Tiger in the home would seem to be enough for most housewives. It must be that Mrs. Martini is a little different, for when the point of disposition of the young Black Leopards came up—provided there were any—she protested, almost tearfully, that she wanted them. We wanted her to have them, too, because of a rather curious point. Our Black Leopards are wonderful parents and share in rearing their young as much as such animals can. We may be sure their cubs will grow up—but then comes the hitch: at somewhere approaching a year, the father has had enough of them and for their own safety they must be removed. But then it turns out that they

are so wild and shy that they cannot endure the separation from their parents. We felt that the only solution lay in bottle-rearing, so Mrs. Martini got her wish.

Ninety days is the period for Black Leopards and ninety days it was. That made it February 23 and on that day the sharp squalls of an infant Leopard were heard, emanating from the darkened sleeping box. After a brief but hectic struggle, we were able to enter and remove little Bagheera. His vital statistics were: sex, male; length, 14 inches; weight, 20 ounces. So far, foster-mother and child are thriving. And some day we may have that great rarity—a tame Black Leopard.



As if her apartment were not already crowded, with a Tiger and two Lion cubs, Mrs. Martini cheerfully took upon herself the duties of foster-mother to a baby Black Leopard. Its routine is like that of the other cubs at an early age—feedings every 3 hours around the clock.

BIRDS Among the Coconuts

By MAJOR RICHARD T. BRICE
with a gloss by LEE S. CRANDALL,
General Curator of the New York Zoological Park

This war has brought the amateur naturalists into their own. It has flung them down in a hundred odd corners of the world, with the result that many are in a position to make real contributions to our knowledge of the fauna of comparatively untouched areas.

An example is the author of this article. Major Brice, of Georgia, "didn't know one bird from another" when he was assigned to the Solomons. His hobby of bird-watching developed rapidly and his notes, uncertain as they are in some instances, help round out our picture of the bird life of those distant islands. General Curator Crandall has kindly consented to annotate Major Brice's account for the added interest of our Members and readers.—*Editor.*

BIRD WATCHING is a nice, convenient hobby because one can pursue it wherever one goes. However, it would have been better—yes, much better—had I taken it up in a civilized land first where I would have had the work of the masters to guide me. Trying to find the correct name of a bird that few people have seen and fewer have identified is no job for a beginner. When I started, however, I didn't know what I was getting into, and now I am too engrossed to stop. For many months I have been spending my spare time here on the Russell Islands trying to learn something of the birds and I have probably acquired as much knowledge of them as a trained observer would have gotten in a week, but I have had more fun at it.

Fortunately, there are others in this area engaged in the same pursuit, most of whom, unlike myself, have some previous experience, and by comparing notes and leaning on their better knowledge I have been able to obtain some confirmation (or usually corrections) for my identifications. First, there is Staff Sergeant George Greeley, who initiated me into the technique of bird observation. He is particularly interested in studying the shore birds, but has spent many Sunday afternoons with me hunting birds in the groves and the jungle. Along with Sergeant Greeley, there is First Sergeant John Griffin, an artist, who has drawn many of the birds for us. Our customary party for a bird trip is composed of "We" (Greeley, Griffin and myself), and sometimes a few hangers on. Pfc. William Beecher, a trained ornithologist working with one of our health units on Guadalcanal, has been my court of last resort on identifications. He has collected a great many specimens and has gone into identification from a true scientific angle. Unfortunately, since he is on another island, my visits with him have been few and far between, else I should not have stumbled around so much.

In the same organization with Beecher is Lt. J. E. Chattin, from whom I obtained the key to the avifauna of the Solomons that I have been using for the past month to check my previous ideas. Col. C. V. Widdy, many years a resident of the Solomons, very kindly devoted several hours to telling me about his interest—the introduction of insectivorous birds to combat pests in the coconut trees. Col. Widdy and Major F. R. Hewitt introduced a number of insect eaters into the area, but as far as the Colonel knows our only introduced bird on the Russells is the Indian Mynah. My own interest is entirely selfish: I watch the birds purely because it is a refreshing, objective hobby far removed from my business of getting on with the war. I make no claims to scientific study or the background required of the intelligent collector.

*Drawing by Sergt. John Griffin***MYNAHS WERE NUMEROUS IN THE COCONUT GROVES, HUNTING INSECT PESTS.**

The Russell Islands are located in 9° South Latitude, 159° East Longitude, which is about 20 miles west and a little north of Cape Esperance on Guadalcanal. Our islands cover an area roughly circular in shape and about twenty miles across. They are composed of two main islands, Banika and Pavuvu, surrounded by some thirty-odd smaller coral islands and a large number of tiny islets and reefs. The two large islands are both tops of almost submerged mountains which rise a thousand feet, more or less, out of the sea. On each of them the central mountain core of volcanic rock is surrounded by a fringing reef and a flat coral plain from fifty yards to a mile or more in width. It is on this plain that most of the large coconut plantations are located, although a few of the smaller islands have been cleared and planted. The interiors of Banika and Pavuvu and all the uncultivated islands are covered with the dense rain forests or jungle typical of the wet tropics. The weather here is ideal for this lush growth, the temperature seldom rising about 90 degrees or dropping below 75, and the rainfall averaging about 150 inches a year. Two-thirds of the rain falls from December to April, but even during the dry season three days without rain is unusual. Although we are below the Equator and our seasons should be reversed from those at home, the rains make our "summer" seem cooler than our "winter." For this reason there are more flowers from June to November, and most of the birds we have observed nesting do so during this season. Counting the ocean, we have four distinct types of terrain—sea, shore, coconut groves and jungle, each with its distinctive bird life, but this article deals only with the birds I have seen in and around the groves.

"Merle des Moluques" is one of the names applied to the Common Mynah, but it has nothing to do with the habits of the bird. The "Indian," or Common Mynah, is a "true" Mynah. Perhaps the article referred to the better-known Hill or "talking" Mynah as the "true Mynah."

The prohibition came a little late, for Common Mynahs were introduced on the West Coast of the U.S. before the regulation went into effect. As yet they have not spread far.

They may have changed their habits; in their regular range they nest from March to April, in holes in trees or cliffs, or even in open trees. Open-tree nests are big rough-domed affairs and the birds lay 3-6 blue eggs.

This is *Mino dumontii kreffti*, usually called Dumont's Mynah, a common jungle bird from the Solomons to New Guinea. "Frugivorous" is a better term than "herbivorous," for the bird is chiefly a fruit-eater. The yellow seeds were the remains of some fruit the bird had eaten. I brought 2 Dumont's Mynahs back from New Guinea in 1928. One was a good talker and used to startle visitors by calling "All out!" long before closing time in the Bird House.

I found myself surrounded on all sides by the Indian Mynah (*Acridotheres tristis*). I had seen them before in New Caledonia, but I had learned them by their French name—Merle des Moloques—which they get from their habit of sitting on the backs of cows and horses, allegedly waiting for a nice fat horsefly. It was several months before I found out their English name, and then I was not too sure because I read an article referring to a "true Mynah bird," which set me to wondering whether ours is a "true" Mynah or some ubiquitous imposter. I still don't know what a "true" Mynah is, but anyway our Indian Mynahs are dark brown birds with yellow bills and feet and yellow elongated eyepatches that turn slightly down at the back, giving them a very cross look, like Mrs. Astor's horse. The Indian Mynahs were introduced here to eat bugs from the tops of the coconut trees, where they spend most of their time when not on the ground, and it is forbidden to shoot one. The birds are quite versatile in their feeding habits, because in addition to finding them pecking on the ground and foraging in the palms, I have seen groups of three or four methodically gleaning small bushes and mangrove stands. They are said to be a nuisance in Australia, which may account for the rigid prohibition against bringing them into the United States.

Although they are very numerous in the coconut groves, where they travel in flocks of ten to fifty, I have never found an Indian Mynah in the jungle. This gave rise to much conjecture as to where they roost and nest, particularly after I had examined the tops of dozens of freshly felled palms without finding a single bird's nest in one. In August I watched Mynahs carrying little bits of straw up into the coconuts, but even in September when a pair fussed about my doorstep for two weeks, flying off with bits of fluff, the nest continued to elude me. Occasionally I stopped writing long enough to rush out and stare after them, but to no avail. It wouldn't have been quite so much of a mystery if there weren't such a tremendous number of the birds, but there are literally thousands here and I couldn't find a nest. Now I know that I was looking for nests before their nesting season began. In the second week in October a friend arranged to have a native climb one of the trees where we had seen much activity, with the result that a nest with one egg was found. Unfortunately our knowledge of Pidgin is limited, so we could not obtain a coherent description of either the nest or the egg, but perhaps if we are patient this too shall be added unto us.

We have a Yellow-black Mynah (*Mino dumontii*), which is a jungle bird, and is as meticulous about not entering the palm groves as his cousin is about not leaving them. Just as the Indian Mynah was almost the first bird we learned in the groves, so this Mynah was among the first that we came to recognize in the jungle. We knew him initially by one of his calls and later by his brilliant orange bill, eyepatch, and legs. Eventually, we identified other of his calls, but if he is as multilingual as some of his relatives he may still be the source of any number of the more tantalizing jungle cries to which we can as yet ascribe no owner. The specimen which we collected had been eating some kind of yellow seeds but we don't know whether he was entirely herbivorous or not. One of the Doctors of the Army Hospital found a pair of these birds nesting in a hole about four feet up on a stump near the shore. Two fledglings with very little down to cover them hatched in April.

After the Indian Mynahs, the Parrots are the next most numerous birds to be seen among the palms. Their gorgeous coloring and raucous voices

make them the most conspicuous birds we have and, being thus in the lime-light, they are blamed for much more of the noise than they actually make. Although there is a profusion of big Parrots and little Parrots and Cockatoos and Parrakeets in the jungle, only two types are common in the groves. The one most frequently seen is an all scarlet fellow (*Eos cardinalus*) about the size and shape of a jay bird. It is called locally a Parrakeet, I think erroneously. The other one is a somewhat smaller bird (*Trichoglossus haematodus*), mixed bright red and foliage green in color, with a noticeably shorter tail. Both types are gregarious as far as their own kind is concerned and are frequently seen in groups of four to fifty individuals. It is a matter of some regret to me that these striking birds are not better provided with common names—one hates to go around spouting poor Latin at so much beauty.

We occasionally see a White Cockatoo (*Cacatura ducorpsii*) or hear one squawking as he flies overhead, but they seldom light in the groves and more properly belong to the jungle where they are very common. They are as large as Crows and have the loudest and most raucous voices of all our Parrots. If these "Jay Birds" of the jungle discover you in an area where they resent your presence—which is almost any clearing—they may fly round and round over your head screeching at the top of their lungs and raising such a clatter that your intrusion is forthwith known. The Cockatoos I have seen are all white with milky blue eyes. I have read that the Sulphur-crested Cockatoo (*Cacatura galerita*, Lath.) is here and many travel books on this area expound upon the "cockatoos with yellow topknots," but it appears that this bird is more common in New Guinea than in the Solomons.

To one who is accustomed to thinking of Parrots as more or less sedentary caged birds, it is a surprise to find that they are fast, strong flyers. They travel in straight flights with a continuous easy motion of the wings, never gliding like the Indian Mynahs or skimming like the Swallows. They are frequently seen traveling between islands which are a mile or more apart and at dusk small groups of three or four Parrots may be seen flying parallel to the shore at an elevation of a hundred feet or more in steady purposeful journey as though in a hurry to get home. This makes me think that they may wander far from their roosts during the day and that they probably return to the same area to roost each night. Both the Parrots and the Cockatoos are much prized by the soldiers as pets, and nearly every unit has at least one. They tame easily and there is much discussion about teaching them to talk. Col. Widdy says that all of them can be taught, but I have never heard one say any intelligible word.

My next discovery was a bird about eighteen inches long which we called a White-headed Osprey. He is a stately, silent bird of prey, chestnut brown on the back and under parts, with pure white head, nape, neck and breast, and five primary feathers extending like fingers out beyond the tip of each wing. His identification gave us considerable trouble: Beecher called him a Brahminy Kite (*Haliastur indus*) from the beginning and someone else here called him a Sea Eagle, while locally he is simply referred to as a "fish hawk." We found a bird we thought was him described in "Birds of Tasmania" by Frank Mervyn Littler and identified as a White-headed Osprey (*Pandion haliaetus*) and then we were sure we had caught Beecher in a mistake, but just recently we have received a copy of a key to the birds of the Solomons, based on Dr. Ernst Mayr's work here before the war, and his description of

Eos cardinalis is properly a Lory, not a Parrakeet. *Trichoglossus haematodus* is a Lorikeet, but there are many forms and I don't know which form or forms are found in the Russells.

"Lory" and "Lorikeet" are the usual common names.

Ducorps's Cockatoo (*Cacatua ducorpsii*) is a better name than "White Cockatoo," for there are many white cockatoos in the southwest Pacific.

Don't believe all you read in travel books. The Sulphur-crested Cockatoo (*Cacatua galerita*) is not found in the Solomons. One form is in Australia, another in New Guinea.

It is a common Parrot habit to range widely for feeding—out at day-break, back at dusk, generally flying in pairs in flocks that may number hundreds. Cockatoos are not very good talkers, but a soldier with plenty of time and patience might teach one a few words.

The bird, as described, is certainly a form of the Brahminy Kite. All the rest of the common names sound like "book" names to me.

Kites will eat pretty nearly anything and are common scavengers in some areas. This is the first time I ever heard of a Kite diving for fish, though; I question the Major's identification in this case. If Kites catch other birds, it is probably a lucky accident.

It would have to be a mighty small kid if this Eagle carried it away. This seems to be part of the familiar legend of Eagles carrying off both goat and human "kids." Sea Eagles mostly eat fish or carrion, but on occasion will attack warm-blooded prey.

It is hard to say, without having the bird in hand, whether this is actually *albogularis*. Three very similar species of Goshawks are found there.

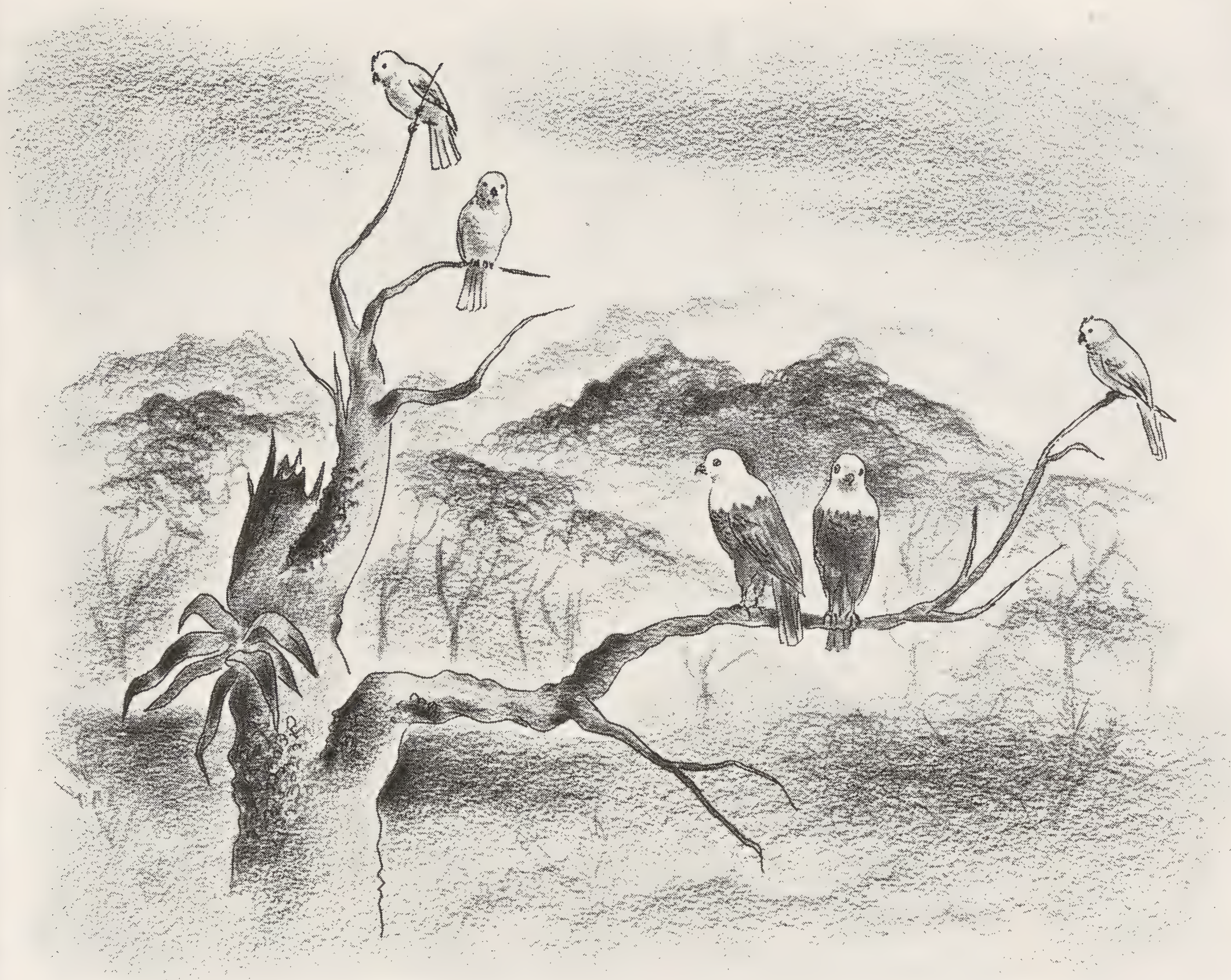
I don't know where Major Brice got this scientific name. The

Haliastur indus fits our bird better. Thus are we humbled before the learned. However, the key gives Mr. Haliastur a common name of Chestnut White Kite and Dr. Thomson in his "Birds of the Cape York Peninsula" calls this same bird a Red-backed Sea-eagle. I presume one has a right to give a local bird whatever name one pleases, so that a Fish Hawk here might be called a Kite somewhere else, but *Haliastur indus* is one and the same the world over, which illustrates the advantage of using the Latin names to compare notes, even if the common names do appeal much more to one's sense of the aesthetic.

Greeley once saw a Kite feeding on a Red Parrot, and I saw one flying with a rat in its talons. I have watched them searching for food over a clump of bushes, sailing round and round and back and forth with heads pointed down at right angles to the body. Even if they didn't turn out to be Ospreys, they do catch fish, as I frequently see them circling offshore, singly or in pairs, and once I saw one dive into the sea from a height of perhaps seventy-five feet, hitting the water with a splash that should have stunned him. I doubt that the Kite succeeds in capturing many of the other birds, for his flight, though graceful, is slow, and the smaller, faster birds with greater dexterity on the wing should have little trouble in eluding him. I have not been able to detect that the smaller birds hide when the Kite is about, and just yesterday I saw two Indian Mynahs flying after a Kite within six inches of his tail. When the noise of my jeep frightened them, they all three lit in the top of the same palm. On the edge of the jungle I have observed two magnificent Kites and three Cockatoos sitting peacefully on the same dead tree.

Our largest and most magnificent bird of prey is a huge, all-brown Sea Eagle (*Haliaeetus sanfordi*) with a wing spread of up to seven feet. He is reported to have attacked a small dog and to have been seen carrying off a kid from a flock of goats. Once when walking along the shore of a small island we saw two Kites and a Fish Hawk unite in an attack on one of these large birds, but with little or no results. For presuming to challenge the monarch, one of the Kites had four of the primary feathers pulled out of his left wing. It is said that a plantation manager once captured one of these Eagles and kept it in captivity and that all it would eat was fish, though how this ties in with the dog and kid stories isn't quite clear. Another story relates that one of the managers found the nest of a Sea Eagle in a tree. It appeared that the Eagle preferred his fish "high," because on coming back to his nest he would drop his fresh catch under the tree to ripen and occasionally pick up one of his older catches to eat. The manager was able to get considerable fresh fish of appreciable size by picking up a catch just as it was brought in.

Of the two other birds of prey I have seen here, one is a beautifully trim Goshawk (*Accipiter albogularis*) with all white under parts and white "pantaloons" down to his knees. His head, nape, and back are usually solid blue-gray, but occasionally one is found black or dark brown in color. The first Goshawk I saw was sitting on top of our shower house one morning when I awoke and I thought he might be a nocturnal prowler, but the only other one I have seen was on the ground eating a lizard about noon of a bright day. When I disturbed him he flew up into a palm tree with his meal. Lastly, we have the Fish Hawk (*Pandion leucocephalus melvillensis*), a slightly smaller bird than the Brahminy Kite, with narrower pointed wings.




 Drawing by Sergt. John Griffin

COCKATOOS AND BRAHMINY KITES WERE FAMILIAR FEATURES OF THE LANDSCAPE.

He has light underparts that look a little bluish and I think he is either gray or blue on top but I have never seen one except from below.

One of our most interesting birds of the palm groves is a Kingfisher. I thought he was the Sacred Kingfisher (*Halcyon sanctus*), which is common in New Caledonia, but Beecher thinks that ours is different and that his name is *Halcyon chloris*, listed by Dr. Thomson as a "Mangrove Kingfisher." He is the only bird that habitually sits on the telephone wires, a ten minutes' drive along any road being sufficient to find at least one and more likely a pair. He is smaller than our common American Belted Kingfisher, and more closely resembles the Ringed Kingfisher of the southwestern states, except that he has a greenish-blue head and back (sometimes almost purple) and a rich buff collar and underparts. His typical Kingfisher's bill is unmistakable to the ornithologist, but to demonstrate my ignorance in such matters, I called him a Woodpecker when I first saw him (I understand we do not have any Woodpeckers here). Nevertheless, he seems to have given up fishing because he never frequents the shore or small streams. Instead he dotes on the little striped lizards which we have in profusion. It is said that he will catch one by the tail and carry it up to a telephone wire or a palm frond, where he hits it against anything handy to break off the tail, but I have never observed

bird is an Osprey and a form of *Pandion haliaetus*. It is more brown than either gray or blue on the back.

My money is on Major Brice's identification instead of Beecher's, if the bird is really buff underneath. That sounds like the Sacred Kingfisher. On the other hand, the Sacred is just a winter visitor from Australia, and the nesting bird is probably the Mangrove Kingfisher.

this. It is true that many of our lizards have stumps or are in the process of growing new tails, but this is not entirely due to the Kingfishers, for the lizards fight among themselves and I have watched a gecko break off and devour the tail of a skink. I think these Kingfishers nest in June here (the beginning of the dry season), because I saw several picking up bits of nesting material then. It was in June that I saw one Kingfisher feeding another, which might have been connected with mating or might have been a parent feeding an almost grown fledgling, but which in any event probably indicates nesting. This bird is an early riser, and stays up long after dark, its call having been heard at four o'clock in the morning and another time at ten o'clock at night.

Our other common Kingfisher, (*Halcyon saurophaga*) is snow white on the head and under parts with sky-blue back, tail and wings. In addition to being more colorful, he is nearly twice the size of his mangrove cousin, or about as big as the Belted Kingfisher in the States. I do not know his common name, but we call him the Shore Kingfisher. He is a true Kingfisher in habits as well as name, because he is only seen along the shore, usually in pairs, sitting patiently as all fishermen must. Although he fishes he is not above a choice lizard, for we found the remains of two skinks in the stomach of the one Greeley collected for a specimen. The calls of our two common Kingfishers are the same—a single slightly harsh note repeated several times—"treek, treek, treek"—except that the Shore Kingfisher's note is pitched a little higher than that of the Mangrove species. Also the Shore bird is less belligerent than the other, which seems continually to be warning some intruder away from his domain.

In addition to the two Kingfishers already mentioned, we have another one which Beecher calls a "River Kingfisher." I have only seen him once and it may be that our lack of many fresh water streams on the Russells accounts for his comparative rarity here. The one I saw darted out of a mangrove thicket near a shallow beach where I was wading and flew perhaps a hundred feet along the sand before disappearing again into the bushes. I can only describe him as an enchanting flash of unbelievable blue seeming no larger than an English Sparrow.

About the time that I began to feel reasonably familiar with most of the birds in the palm groves, I discovered a flock of glossy black birds about the size of the common Blackbirds at home. It was in May, and I thought I had discovered migratory visitors from Australia or New Zealand come up to "winter" with us, but after finding them in profusion in the jungle, I decided that my suspicions of migration are unfounded—they probably only "migrate" to and from the groves. The one Greeley collected had a greenish metallic sheen to the feathers on the nape of the neck and reddish-orange eyes. For months we knew this bird only as "the black bird with the orange eyes" and though we now know him to be the Social Starling (*Aplonis metallica*), he is still our "mystery bird" with two apparently distinct sets of habits. He is not a daily visitor to the groves and weeks may go by without my ever seeing one near my hut, but when they do come there will be from ten to twenty-five in a flock, all busily engaged in searching for insects, sometimes settling along the rib of a palm frond, all in a row close together and facing the same direction. In their gleaning outside the jungle they work in a group, descending upon the same tree or bush, twittering and chirping as they go, but in

Good work! Reference books call it the "Beach Kingfisher."

There is a River Kingfisher, and it is blue above. But it is larger than an English Sparrow.

I remember being confused in New Guinea myself, by 2 species of Starlings, and can sympathize with Major Brice. Five species of *Aplonis* are in the Solomons, as well as several subspecies. I never heard the name "Social Starling;" the Solomon Starlings are all called Glossy Starlings, of one kind or another.

addition to liking insects they are very fond of pecking the seeds from Elephant Ears.

In the jungle they seem to have quite a different character, spreading out over more territory and frequently traveling singly or in pairs with the other members of what might be a group dispersed in nearby trees. To add to the confusion, they have at least two distinct calls which they make very frequently in the jungle but which we seldom hear in the groves, and neither of which have we ever heard in the vicinity of their nesting trees.

The first bird nest I ever saw in the deep jungle belonged to a pair of these Starlings. It was a very neat conical affair, about four inches across at the top and tapering down to a sharp point. They had built it about twenty feet from the ground in the fork of a Philodendron vine where a branching tendril gave added support and two of the large leaves above provided some protection from the rain. We discovered the nest in July and the owners were working on it then, but although there were many other Starlings about and we watched carefully, we could find no other nests. Early in October we discovered a group of what we thought were new birds nesting in colonies in old dead trees. The nests were hanging, shapeless, masses of material, so closely resembling the air roots of the orchids and epiphytic ferns common on the jungle trees that we had to watch for some time to be sure they were nests. There was no resemblance between these nests and the nest structure we had previously observed, and nowhere near the dead trees did we hear the familiar calls—only chirpings and twitterings—but the specimen we collected was our old friend “the black bird with the orange eyes.” Now we are again impaled upon the horns of a dilemma. Are we watching two birds so closely resembling each other that we can’t distinguish them, or are we studying a dual and complicated personality in one species? Either theory would explain away our doubts, but only further observation will satisfy our curiosity.¹

When they are about their nesting tree, the Starlings do considerable fluttering and milling around, never seeming to fly direct to their own nests. When they leave their nesting trees they fly fast and straight for perhaps a hundred yards and then stop to survey the landscape before proceeding. Likewise, when they return they alight in the same location and take a short look around before flying the home stretch. They appear to have certain approved places to stop for their reconnaissance, because we watched a continual stream of them lighting and taking off in a small tree, the top twigs of which had apparently been worn quite bare by the traffic. They always landed in the same tree, and never in the adjacent ones. That October is the nesting season we gathered from the number of birds flying in with small vines perhaps a foot long streaming out behind them.

Our nearest approach to the Hummingbirds on the Russells is the little Yellow-breasted Sunbird (*Cinnyris jugularis*). These tiny creatures, less than three inches long, are dull yellow on the back and brilliant yellow underneath, with a blue-black patch setting off the neck and throat of the males. They sup on nectar from the flowers and probably eat a few small insects. They seem as widely distributed as the Parrots, being equally at home in a planter’s flower garden, the top of a palm tree, a mangrove swamp

This could be any one of 3 species of Glossy Starling, but not the one the Major calls *metallica*; it is a colonial nester.

Here we have *metallica*; the colonial nester.

The dilemma can be resolved simply enough—they were watching 5 species of Glossy Starlings, all a good deal alike in appearance, but widely differing in nesting habits. I can’t make anything of the footnote; maybe Beecher was kidding.

¹ Since writing the above I have received a note from Beecher saying “You have just described a new species of red-eyed starling without the long tail feathers of *Aplonis metallica*. I call it *Aplonis brevicauda*.” Maybe this is the answer.

Take another look, Major! Sunbirds can, and do, hover. But they can't fly backward. On the other hand, they can walk and jump, and Hummers can't.

This is a Swiftlet, a kind of pigmy Swift, instead of a true Swift. *Esculenta* is one of several species that produce the edible nests of which the Chinese are supposed to be so fond.

Here was a chance for Major Brice to sample that great "delicacy," birds' nest soup. But I wouldn't have cared to try it, either.

or the densest part of the jungle. They fly rapidly with fast wings, but they do not "hum" or hover, and I doubt that they can fly backward like our hummingbirds at home. They seem quite unafraid of human beings, and will dart around among the flowers almost within reach.

These birds nest early in the "fall" for it was during the second week in April, before the rainy season had gone, that Greeley found a young Sunbird among the coconut-log seats of one of our fresh air theaters. The little fellow was apparently unable to fly so Greeley picked it up and took it into a nearby hospital tent where it astounded everyone by flying the length of the tent and perching on the frame.

It is supposed to be a mark of proficiency for an amateur to tell the Swifts from the Swallows, and certainly I am not proficient enough for this. I can only tell ours apart because they are different colors and have distinguishing habits. Our most common Swifts, which I call the "Blue Swifts" and are identified by Beecher as *Callocalia esculenta*, have dark glossy blue backs and light almost white throats and chests. They are most common in the interior of the groves and in the jungles where they occur in flocks of six to twelve, skimming about in search of insects which they must catch on the wing because they never seem to light. While resting on the bank of Tenaru River at the 'Canal, I watched one scoop a drink of water without so much as pausing in his flight (thus does nature soon forget the noise and turmoil of man's wars and battles). In the jungle I have watched groups of these birds encircling those trees which have the densest foliage and are most heavily encompassed in a mantle of vines, but just what was attracting them there I could not determine. That they must feed on only the smallest insects we learned from the infinitesimal throat of our specimen. It is possible that the small throat makes them harmless to larger insects, because several times we have seen these Swifts being chased by large moths or butterflies.

The Blue Swifts nest in dusky caves or deep crevasses in the coral cliffs. During the third week in October I entered one of their nesting caves and found about a dozen small nests attached to the rock ceiling. There were undoubtedly more nests, for I estimated that at least fifty birds were flying in and out, but the cave narrowed to a slit farther back and I couldn't get all the way in. When the Swifts came out of their cave they flew rapidly away into the jungle, hardly pausing near the entrance to their home. Neither the entrance nor the floor of the cave were befouled with droppings, although there were some broken egg shells lying about.

Each nest was constructed separately and cemented to the rock by a clear hard substance which I presume to be saliva. The nest itself was made of fine grass moss and vine tendrils woven and cemented together in the form of a hollow hemisphere open on the side. The inside of the nest was barely larger than a golf ball and the two little white elongated eggs I found in one nest were lying near the open edge with hardly anything to keep them from rolling out. All the nests were very clean and free from droppings, but the birds probably harbor parasites, because I found a blond bedbug crawling around in one of the nests.

The other Swift we recognize here is an interesting bird nearly eleven inches long, mostly blue and white with a blue-black crown. I first described him as a huge swallow with long narrow crescent-shaped wings. Later Greeley



Drawing by Sergt. John Griffin

LIZARD-EATING KINGFISHERS WERE ALWAYS SITTING ON TELEPHONE WIRES.

observed several of them flying about in the deep twilight catching bugs around electric lights and we thought maybe they were Nighthawks. Only after we collected one and sent the description to Beecher did we get the answer: the Whiskered Tree Swift (*Hemiprocne mystacea*). The name is very fitting and proper because the bird has a most entrancing white moustache which must have come straight from a gay 'nineties saloon. Unfortunately the hirsute adornment is quite invisible when the bird is flying; his most obvious characteristic in the air, besides his wings, being a deep forked tail. Just to keep us guessing, the tail folds up into a single thin line and loses its forked appearance when the bird is at rest. Until we learned the secret of how it folds, we were much puzzled to know why our specimen didn't resemble the bird we saw flying, and we thought at first it was a different bird.

The only Swallows I recognize are *Hirundo tahitica*, which are well known throughout the Pacific area, though I don't know their common name. They are a usual sight along the shore and in the groves not too far inland and think nothing of flying out over the water to play about a ship half a mile or so from land. They seem a little bigger than the Blue Swifts, being about four inches long, and have a blue-brown back, an inconspicuous chestnut patch under the throat, a grayish chest, and an abdomen marked with a single

"Pacific Swallow" is the common name.

dark streak down the middle. Unlike the Blue Swifts, the Swallow frequently stops for rest and likes to sit on mangrove roots or on old stumps out in the water. He isn't as gregarious, either, and seems content in company with three or four of his own kind. In June a pair of these Swallows built a home and raised a family under the eaves of the Provost Marshal's office, seeming not to mind the soldiers being always about, although they would not approach their nest if anyone was within six feet of it. At such times they would light on a nearby wire and fidget till the intruder moved farther away. The nest, which rested on a beam, was about five inches across and open at the top, as a nest should be. The outside structure was all mud and the inside, which was big enough to almost completely conceal the setting bird, was lined with bits of soft downy material. This same nest was occupied again in October when I watched the mother carrying out pieces of brown mottled egg shells and feeding her babies.

As far as I know, the only game bird we have is the Black Duck (*Anas superciliosa*, Gmelin). This is a beautiful bird resembling our wild ducks in the United States so closely that it seems an incongruity among the palm trees. Somehow I have not been able to reconcile ducks and the tropics, and though I have seen them flying and have examined the specimen we collected, I still think there must be some mistake. We first heard reports of the ducks from the natives, but I, being a born skeptic, decided the natives didn't know a duck when they saw one. After that we got reports from other sources and when I saw three ducks swimming in a pool on a neighboring island I had to give in and admit that we have real live ducks.

I have almost forgotten to mention our Gallinules (*Porphyrio melanotus*). Soon after I arrived on the Island I heard stories of a "wild chicken" to be seen in the groves just at the edge of the jungle, but it was several months before I finally saw one. They are the size and roughly the same shape as a frying-size roaster, except that the legs are noticeably longer for the body. Coloring is jet black on the upper parts with a deep blue breast and a white fluff under the tail, which is exposed from time to time when the birds walk, but not when they fly. Their most outstanding feature is a brilliant red beak and a pert little red tam-o-shanter set coyly just over the eyes. Greeley was the one who recognized this bird as the Gallinule, called locally a mud hen, and the identification was confirmed by a picture of the American species, identical except for color, which my mother clipped from the National Geographic Magazine for me.

The name "wild chicken" is not a bad guess, because the bird is not too distantly related to the domestic fowl. It flies little, seldom over a hundred yards at a time, and lives most of its life on the ground. The young, which are hatched from August to October, are precocial—that is to say, they are born with fuzz like little chicks and can feed themselves. Several people have reported seeing a hen with chicks but by some quirk of poetic justice this sight has been denied "We." Fortunately for the Gallinule, it is not considered a table delicacy, some people complaining of its being tough, and others saying that it has a strong and slightly fishy taste. A few hardy souls occasionally boil one in soup, but the demand is not sufficient to threaten seriously the bird's existence. A far greater peril is the predilection of rats for eggs and young birds, and how the Gallinule protects its family from this danger is somewhat of a mystery.

A better name is the Gray Duck; a subspecies of *superciliosa* is in the islands. There are many Ducks in the tropics.

More likely *Porphyrio porphyrio* than *P. melanotus*.

I wouldn't say it is related to domestic fowl, even distantly. It is actually a Rail.

Protection from rats is probably no problem to a Gallinule, for it can bite good and hard. It can even run across lily pads, without sinking, and a rat would have a hard time keeping up.

No story of our birds would be complete without a tribute to the Golden Plover (Pacific subspecies), a yearly visitor from Alaska and our own great Northwest. To me they are visitors from home for which I have a special feeling of warmth and friendliness. I had just come to recognize them in May, when they left us to go North and raise their families. They came back in September, and I have seen several during the last few weeks. That they are the only winter visitors here and that this is not their home is proved by their actions, for although they remain in the South Seas almost nine months out of the year they raise no families here and Col. Widdy told me that their eggs have never been found in this area.

In closing I must warn the reader to take the identifications, particularly the Latin names, with the proverbial grain of salt. At the beginning I intended to use only the common names, but when this became more and more confusing I decided to include the best information I could get on the Latin names, in the hope that not too many of them are wrong. Those which are correct can be attributed to Beecher's painstaking work, and the wrong ones can be blamed on my own ignorance.

Of course, I haven't covered all our birds, just those seen most often from the groves, and one or two of their close relatives in the jungle. The jungle birds, and the birds of the sea, and the waders at the shore, all deserve their own description which, if included here, would extend this writing beyond all reason. Mayhap, if the spirit move me, I'll write of them some other time.

Hope you will!



"We," the bird-watching triumvirate of the Russell Islands. Left to right: the author (with a Kite); Staff Sergeant George Greeley, and 1st Sergeant John Griffin. Photograph by Colonel W. L. Dennen.

The POISONOUS SNAKES of the NEW WORLD. Part 5

By CLIFFORD H. POPE

Fellow of the New York Zoological Society; Curator of Reptiles of the Chicago Natural History Museum.

[This article concludes the text of the booklet by Mr. Pope which has been published in separate form by the New York Zoological Society]

IMPROPER TREATMENT OF SNAKE POISONING

Two facts make it difficult to eradicate the faith placed in various and sundry remedies for snake poisoning: about eighty-five per cent. of victims (in the United States) recover without efficacious treatment, and many persons bitten by a harmless snake "cure" themselves by using utterly worthless remedies. In all parts of the world, rural inhabitants believe that snake poisoning can be cured by this or that method and hundreds of alleged cures have been investigated by scientists and pronounced useless. In the United States, an old favorite is to cut a fowl in half and apply it while still warm to the wound; a simpler one is to soak the bitten part in kerosene or turpentine. Science itself is not infallible; it has advocated various substances as neutralizers of the venom only to reject them later. The most widely advertised of these was potassium permanganate to be applied locally in crystal form or in solution. Even today many medical books prescribe this compound that actually does harm by damaging the already sorely taxed tissues. A harmless remedy is extremely dangerous if its use wastes valuable time.

Any procedure is futile that does not either retard the spread of the venom or remove or neutralize some of it. A loose ligature retards spread of the venom, incision followed by sucking removes some of it, and injection of a serum pre-

pared especially for the purpose neutralizes much of what remains; all other treatment except that recommended by a competent doctor should be regarded as harmful. In the United States, where death by bites probably do not exceed one hundred and fifty annually, snake poisoning is so uncommon that many doctors do not know what to do with a case. It behooves everyone unduly exposed to prepare for an emergency because the available doctors may have little idea how to proceed without detailed directions.

PROPER TREATMENT OF SNAKE POISONING

A person bitten by a snake, if he has absorbed much of the foregoing information, should be able to decide whether the offending reptile is poisonous; anyone without such knowledge may be severely taxed in making a decision. When identity is in doubt, the victim should wait until either burning or shooting pain, swelling, or discoloration at the site of the bite is convincing; if the case is severe, the action of the venom will be evident within ten minutes. It must be borne in mind that great anxiety may give rise to imaginary symptoms, especially pain.

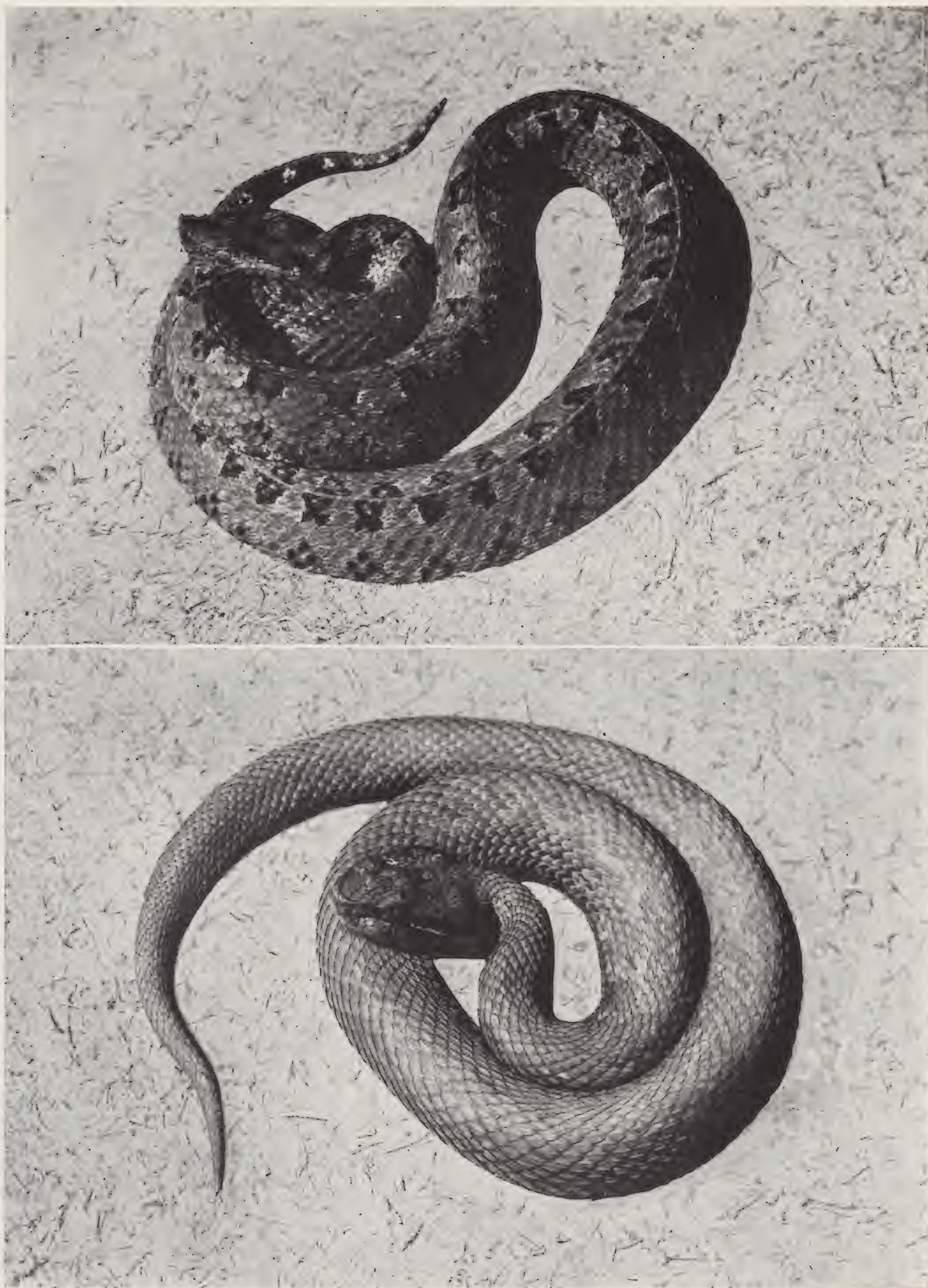
Among authorities in the United States there is general agreement on the following first-aid directions for snake poisoning.

1. Pause a minute or two to look the situation over and take steps to get medical aid. Plan an immediate procedure that involves little running or other exertion. Also try to realize that panic, like exertion, will only decrease the chance of survival by increasing the circulation. Do not take any kind of alcoholic drink.



Upper — Fig. 39. March's Palm Viper, *Trimeresurus nigroviridis marchi*. An arboreal pit-viper of Honduras, the bite of which is sometimes fatal. The adults are about 30 inches long and are green in color, but the juveniles are brown.

Lower — Fig. 40. Schlegel's Palm Viper, *Trimeresurus schlegelii*. This arboreal pit-viper occurs in northwestern South America as well as in Central America and is somewhat smaller than March's palm viper. The coloration is too variable to be useful in sight identification but the presence of erect, horn-like projections above the eye will help distinguish it.



Upper — Fig. 41. Hognosed Pit-viper, *Trimeresurus nasutus*. Found in southern tropical Mexico, Central America and the humid coastal region of northwestern South America, this small species is characterized by an upturned snout.

Lower — Fig. 42. Godman's Pit-viper, *Trimeresurus godmani*. This is a small snake of Central America and extreme southeastern Mexico.

2. Apply a tourniquet a short distance above the wound, that is, between it and the heart.

A necktie, a shoestring, or any strip of cloth can be used, but it should not be bound tightly; the object is to stop the flow of lymph without greatly retarding the circulation of blood. In the case of a bitten arm or leg, the tourniquet should be adjusted so that a finger can be forced between it and the skin.

3. After sterilizing the wound and a sharp instrument such as a knife or razor blade, make incisions at right angles across the fang puncture.

The depth of the cuts will, of course, vary with the size of the snake and the position of the bite; deep cutting into some parts of the body will cause excessive bleeding or do other serious damage. A cut not more than a quarter of an inch deep will suffice in most cases even though the bite of a five- or six-foot snake in a fleshy part of the body might call for one of double depth. If blood spurts from the wound because an artery has been accidentally severed, a hard object slipped under the tourniquet at a point over the artery will help stem the flow of blood. The cutting blade can be sterilized with the flame of a match.

4. Apply suction to the cuts.

If no mechanical means is available, use the mouth unless there are open sores in it; venom does not damage healthy mucous membrane and can even be swallowed.

5. As the swelling progresses, shift the tourniquet to a point just above it and continue to suck for about an hour, making many additional cuts at the base of the swollen area.

6. If antivenin is available, inject 5 ampouls (50 cc.) directly into the bite or area surrounding it and stop sucking for an hour.

Under all ordinary circumstances a doctor will now be on hand and the first-aid treatment ended. Sucking of the wound is often continued for as many as fifteen hours.

It was once thought that antivenin, the serum taken from immunized horses, had solved the

snake-poisoning problem, but the work of Dr. Dudley Jackson and others has shown that mechanical removal of the venom by suction is, after all, the best method, especially for treatment of bites by the New World pit-vipers with their predominantly haemotoxic venoms. Outfits made up essentially of a sharp instrument, a tourniquet, a suction bulb, and an antiseptic are sold by many pharmacists in the United States for a small sum. Various types of antivenin with ample directions are on the market in several countries. Antivenin is expensive and must be used with caution because a large injection into a person who has received a mild bite may produce exceedingly unpleasant results.

BIBLIOGRAPHY

- I. POPULAR WORKS THAT MAY BE SEEN AT PUBLIC LIBRARIES OR ORDERED THROUGH BOOK STORES OF THE UNITED STATES.
 - What Snake is That? A Field Guide to the Snakes of the United States East of the Rocky Mountains [Published 1939] *Roger Conant and William Bridges*
D. Appleton-Century Company, New York
 - Field Book of Snakes of the United States and Canada (Published 1941).....*Karl P. Schmidt and D. Dwight Davis*
G. P. Putnam's Sons, New York
 - Snakes of the World [Published 1931].....*Raymond L. Ditmars*
The Macmillan Company, New York
 - Snakes Alive and How They Live [Published 1937].....*Clifford H. Pope*
Viking Press, New York
- II. WORKS AVAILABLE ONLY AT LARGE UNIVERSITY AND SCIENTIFIC LIBRARIES OF LARGE CITIES OR IN PUBLIC LIBRARIES OF LARGE CITIES OF THE UNITED STATES. MOST OF THESE ARE DETAILED AND TECHNICAL.
 - A General Consideration of Snake Poisoning and Observations on Neotropical Pit-vipers [Published 1925].....*Alfranio do Amaral*
Harvard University Press, Cambridge, Massachusetts
 - La Défense Contre L'Ophidisme [Second edition, published 1914].....*Vital Brazil*
Institut Sérothérapique, Sao Paulo, Brazil
 - Venoms, Venomous Animals and Antivenomous Serum—Therapeutics [Translation, published 1908].....*Albert Calmette*
John Bole, Sons & Danielsson, London
 - Snake Bite in the United States.....*Thomas S. Githens*
The Scientific Monthly, August 1935, pp. 163-167
 - The Rattlesnakes, Genera *Sistrurus* and *Crotalus*. A Study in Zoogeography and Evolution [Published 1940].....*Howard K. Gloyd*
The Chicago Academy of Sciences, Chicago
 - A Key to the Rattlesnakes with Summary of Characteristics [Published 1936].....*Laurence M. Klauber*
Transactions of the San Diego Society of Natural History, Vol. 8, pp. 185-276
 - Snake Venoms. An Investigation of Venomous Snakes with Special Reference to the Phenomena of their Venoms [Published 1909].....*Hideyo Noguchi*
Carnegie Institute of Washington, Washington, D. C.
 - Animaux Venimeux et Venins. La Fonction Venimeuse chez tous les Animaux; les Appareils Venimeux, les Venins et leurs Propriétés; les Fonctions et Usages des Venins; l'Envenimation et son Traitement [Published 1922].....*Marie Phisalix*
Masson & Cie, Paris
 - Bulletin of the Antivenin Institute of America [Published 1927-1932].....*Various Authors*
Antivenin Institute of America, Glenolden, Pennsylvania

It Died a SCARLET Ibis

By HATTIE ETTINGER

*Secretary to the Director, St. Louis
Zoological Park*

RECORDED on the December casualty list of the Garden is the death of our only scarlet ibis. Notable even in a period when the loss of each specimen is begrudged and we are filled with nostalgic longings for long-tailed birds of paradise and fairy bluebirds, this bird merits a special eulogy, for it died a *scarlet* ibis. On arrival in the fall of 1933, it was a scarlet ibis; but most of the years between it was a dingy gray-white.

One of three purchased from a New York dealer, on arrival at the Garden our ibis (*Guara rubra*) was in full adult plumage, scarlet from the tips of its long, down-curved bill to its toes, save for four black-tipped primary feathers. The three birds were exhibited in the open, planted patio of our Tropical Bird House. Seen against the lush green foliage, fronted by a pool of water, visitors were privileged to see a setting rivalling the beauty of the bird in its native haunts, the coast of South America from Venezuela to Brazil. Writers who have seen the scarlet ibis along the mud flats and against the mangrove forests have written that "the mangroves appear spattered with blood;" compared its coloring to rubies and to "rose-colored clouds lighted by the morning sun;" its flight to "jets of flame."

Like the coloring of the roseate flamingo and roseate spoonbill, all of which obtain their food industriously patrolling the mud flats, the coloring of the scarlet ibis was known to be an elusive thing, diminishing in intensity with each molt. This fact is noted all through the literature. It seemed apparent that food in captivity could not be expected to substitute for the tiny animal life responsible for the glowing pinks and reds of these three birds.

Two years ago the Bronx Zoo experimented with a special diet to restore color to certain birds. The St. Louis Zoo tried it, too—with additions—and here is what happened.

Not too much is known of the molts of the ibis in reaching the scarlet livery of adulthood. Hunters say three to four years are required. Neither is the time of molt of the adult bird known, but apparently it is slow and ill-defined. F. P. and A. P. Penard (1909) write of the bird as they observed it in Dutch Guiana: "—we have seen molting birds from January to December."

True to expectation, our three ibises molted from scarlet to rose to dingy white, and finally, our one remaining bird was relegated to our large Flight Cage where storks, cranes, gulls and other birds are exhibited. Although I knew there was an inconspicuous little gray-white bird in the Cage (the scarlet ibis measures about twenty-four inches from bill to tail, but appeared small in contrast with the tall storks and cranes), I did not associate it with the SCARLET IBIS (*Guara rubra*) which continued to appear each year on our census list until I took my first bird census in 1942, and did some checking. Each time thereafter that I saw the ibis, usually perched in a tree with its curved bill resting on its breast, I would pass by with a shake of the head. This bird was only a ghost of itself!

In the spring of 1943, George P. Vierheller, director of the Garden, read with great interest of Lee Crandall's dietary experiment with the three species of flamingoes at the New York Zoological Park, on which Mr. Crandall reported



St. Louis Zoo Photo

The Patio of the St. Louis Zoo's Tropical Bird House is famous—and deservedly so. Here, among luxuriant planting, without wire screens or glass barriers, many kinds of brilliant birds are at complete liberty. They recognize it as home, and never fly out. In this Patio the Scarlet Ibis was exhibited.

in the March-April issue of *Animal Kingdom*:

“—we have succeeded in wintering our ten Flamingoes, of three species, in really superb condition, a feat which is itself unparalleled in our experience. Moreover, when the birds emerge from winter quarters, somewhere about April 1, our three birds of American form will carry a plumage of a brilliance never seen before.

“No secret formula is involved. The whole process has been purely empirical and just how the change has been accomplished, we still do not surely know. We only know that we used every food item known to us that might give the necessary oils and vitamins for the production of the coveted pigment, limited only by the rather peculiar and fastidious feeding habits of the birds.”

Mr. Crandall listed the following items included in the diet of New York's flamingoes: “whole wheat, soft and white; dog biscuit; boiled rice; sweet peppers, grated fresh daily; raw carrots, finely ground; fresh shrimp; codliver oil and brewer's yeast.”

The yearly cycle of our flamingoes had been as follows: through the summer months, the birds foraged for themselves on our water fowl lakes. During the winter, spent in quarters at our large Flight Cage, their food had consisted of fish and whole-wheat bread. Various attempts had been made to prevent “fading.” Fresh and dried shrimp had been given, but, at best, it had merely slowed down the seemingly inevitable loss of coloring. Our six roseate flamingoes (*Phoenicopterus ruber*), from the famous introduced nesting colony at Hialeah Race Track, near Miami, Florida, and presented to us by the Hialeah Association, and two Chilean flamingoes (*Phoenicopterus chilensis*) were already less intense in coloring after several years at the Garden.

Mr. Vierheller consulted with August Abendroth, head of our Tropical Bird House, who

welcomed the opportunity to work with the flamingoes. Plans were made to winter the birds in the wing of the Bird House, instead of their old winter quarters at the Cage, and all summer Gus waited impatiently for the birds to be brought into their new winter quarters, where it would be possible to segregate them and thus control their food.

The diet Gus worked out, based on Mr. Crandall's formula, consisted of the following: carrots, ground shrimp, sweet red pepper (when obtainable), prepared dog-food meal, cooked wheat, codliver oil and yeast. Two additions were made: dried Mexican flies, already in use at the Bird House in the feeding of soft-bill birds, and ground red beets, thrown in for luck and for color.

The new diet was started in October, 1943. Shortly afterwards, I remembered the scarlet ibis at the Bird Cage, and suggested that it also be given the same mix. The mix was faithfully given each day, in tubs of water to the flamingoes which normally obtain their food by straining it from water.

Within a few months, I was sure deeper colored feathers were beginning to appear in the plumages of the roseate flamingoes, particularly under the wings and about the head. Change in the Chilean flamingoes, smaller and less colorful birds, was a moot point. Mr. Vierheller and Gus, more cautious than I, persistently refused to commit themselves to an expression of opinion as to whether or not the coloring of the birds of either species was deeper. Finally, in February, Mr. Vierheller, with a twinkle in his eye, sug-

gested that I run down to the Cage to see the ibis, which I had all but forgotten. Such a sight as greeted my eyes! Little tufts of *bright red feathers* were scattered through the bird's dingy gray-white plumage! Color was also beginning to appear in the legs, and the long, down-curved bill was a perky pink!

By early spring, the molt of the ibis was completed. Save for the black tips of the first four primaries and olive-drab scattered through the primaries and secondaries, the bird was scarlet from bill to toe. The roseate flamingoes, it was now unanimously agreed, were definitely deeper in color. While improvement in color was not so obvious in the Chilean flamingoes, it was probably slightly so, and, in addition, we had wintered our birds without a loss.

The scarlet ibis, with an explanatory sign, was placed on special exhibition to show its blossoming to our visitors.

The second molt of our flamingoes under the new regime is now completed, and the birds, both Chilean and roseate, are a beautiful sight, in deeper coloring than when they were originally received at the Garden. In addition, they are fine, plump birds.

Much to our regret, the ibis did not live for its second molt. Although we were disappointed, we realized the bird had been at the Garden eleven years. Since it was not less than four years old on arrival, it had lived to the ripe old age of fifteen years, and proved to the satisfaction of the staff here that this type of pigment coloring can not only be *retained* in captivity, but also can be *restored* when lost.

The Humor and Myth of Linnaeus

By WILLIAM BEEBE

LET US SUPPOSE I am sitting in my library and that I crave something new and unread, something unexpected which contains a satisfying combination of interest, knowledge, science, humor and myth. I reach up and pull down a book at random. It turns out to be an old Latin Dictionary, a mere list of technical names, published exactly 186 years ago. Could any less promising volume be imagined? As well offer a list of colors to a blind person or an ephemeris to a coal miner.

But to a scientist miracles are not wholly alien things. The most unlikely place may magic a new discovery, and in dusty tomes of old, jewels are sometimes hidden.

However barren from a literary aspect our dictionary seems, it is the veritable bible of science, the original basic nomenclature, the foundation of all the language of the world's science. It is bound in rusty leather, the edges of the leaves are pink, it is the Tenth Edition of the world-famous *Systema Naturae* of Carl Linnaeus. Within its 823 pages are the names of all the animals known to the author, beginning with himself (and consequently ourselves), *Homo Sapiens*, and ending with that microscopic plant-animal, *Volvox polymorpho-mutabilis*.

The description of the various creatures are of varying length, as clear and diagnostic as they are short. Only recently I became aware that some of the beasts had appended a sentence or two of unexpected import. Five of these are the sole cause for this lengthy preamble, five delightful, improbable bits, translated from Carl's staccato, dignified Latin into English, and wholly satisfying my desire for the aforesaid interest, knowledge, science, humor and myth. As we read them and chuckle we suddenly perceive a very human side of Linnaeus, a new facet of the

studious Swede: we realize that however inevitably accurate we must rate his nomenclature, he must have read and believed considerable of the true and the false of Pliny, Gesner and even John Mandeville, and we cherish the great man more than ever.

Vespertilio Vampyrus (Vampire Bat)

At night sucks in the blood of the sleeping, the combs of cocks and the juice of palm trees.

Trichechus Manatus (Manatee)

Lives in American seas. Eats vegetable matter; becomes tame; is delighted by music. Flesh edible.

Bradypus Tridactylus (Sloth)

Body very hairy, tenacious of life. Climbs easily; walks with difficulty and exceedingly slowly, turns its head as though in astonishment; call, an exciting senarius; noise frightful, tears plentiful.

Felis Catus (Cat)

Habits like allied forms, quiet, purrs (*ore molat*), erects tail; when roused is most agile, climbs, when angry emits an ambrosial odor; the lion of mice, she moves her tail when intent on prey; her eyes shine in the night, when she desires prey she devours it eagerly; makes love wretchedly with yowling and squabbling. Eats meat but disdains vegetables; in the next instant washes her face with her hand; when thrown from a high place, falls on her feet. Doesn't have fleas.

Camelus Dromedarius (Camel)

A second, chambered stomach for pure water providing for a long time in the thirsty desert. Carries burdens, makes haste slowly, when weary lies down on its breast.

(Adapted from *The Book of Naturalists, an Anthology of the Best Natural History*, by William Beebe, published by Alfred Knopf.)

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

The Department of Insects at The Zoological Park

By FAIRFIELD OSBORN

These brief lines constitute a preliminary announcement of a highly important development, namely, the establishment of a Department of Insects and the appointment of Mr. Brayton Eddy as its first Curator. In the next issue of *ANIMAL KINGDOM* a full report will be made of the activities and aims of this new department.

The Zoological Society considers itself fortunate to have obtained the services of Mr. Eddy, whose training and experience qualify him to an unusual degree for his future work with us. He was graduated from Brown University in 1921 and subsequently took special courses in entomology at Cornell University. He is the author of a large number of articles and the co-author of two books; he has lectured throughout the country on insects, water animals and wildlife conservation. Further, he has attained outstanding success in exhibiting large collections of living insects of various types in insect "zoos" near Providence, Rhode Island, and at Detroit, Michigan. Mr. Eddy is resigning his position as Administrator of the Division of Entomology and Plant Industry of the State of Rhode Island to join the staff of our Society. We extend to him the warmest of welcomes.

Début of the Cubs

As a footnote to General Curator Crandall's "News from the Nursery" in this issue of *ANIMAL KINGDOM*, we must report that on Thursday, March 22, the Tiger and two Lion cubs were formally introduced to the public. In the presence of Members of the Zoological Society, invited to the special pre-view, they were brought out of the apartment where they have been in the care of Mrs. Fred Martini since birth, and were given the freedom of a big and newly-rebuilt compartment in the Lion House.

Following the début, tea was served in the

Members' Lounge in the Administration Building. The cubs were not invited to the tea—for the last two weeks before they left the Martini apartment they were so rambunctious that at times it was doubtful whether the Martini furniture would last until their new home in the Lion House was ready.

A Hummingbird Is Working On A Nest—and We're Hoping

Nobody has ever managed to breed Hummingbirds in captivity. But a Violet-eared Hummer from western Costa Rica is building a nest in the Main Bird House . . . her mate is most attentive . . . and we are wondering and hoping. After all, there has to be a first time for everything.

Although we had a pair of Violet-ears, they have been kept apart until recently, for Hummers are ferocious fighters and it is generally impossible to keep two of them in the same cage.

During the early spring the female was quartered temporarily in the New England Garden habitat cage. In the adjacent Desert Cage a nesting box and a handful of raffia had been hung up for the convenience of a pair of Zebra Finches, which proceeded to carry the raffia into the box. The first we knew of the Hummingbird's interest was when she found a tiny knothole in the back of the Zebra Finch nestbox and began pulling out strands of raffia.

In a short time she had laid the foundations of a nest of her own in the top of an evergreen in the New England Garden. The Bird House staff immediately matched her interest and began supplying choicer nesting materials—cotton, milkweed silk, dried moss and even a handful of spider webs.

Nestbuilding went on so energetically that Curator Crandall began to consider the possibility that the female was really serious. He inspected our male Violet-ear, found he had recovered from his moult, and ordered him introduced into the New England Garden.

It was done simply and easily, first by confining the male in a small cage hung on the Garden wall for a couple of days until both the male and the female became accustomed to each other. Then he was liberated. No fighting ensued; in fact, the two birds appeared to be quite friendly.

To date the male's contribution to the domestic scene is mostly one of morale—he sits on a perch and sings while the female busies herself around the nest. His song, incidentally, is surprisingly loud; a squeaky *chip-chip* that at times almost becomes a short melody. It can be heard all over the building, even above the calls and songs of much larger birds.

Up to now there are no eggs. Hummingbirds have nested rarely in other collections, and it may be that a nest is all we will get out of this experiment. But we're hoping for more.

Grand Opening: April 7

Bright and shining and the liveliest spot in the whole Zoo, the Children's Zoo will reopen for its fifth season on Saturday morning, April 7.

The big new feature this year will be a "Fish-bowl" for the younger visitors where, with the exercise of a little imagination, they can believe they are actually walking through the water with the bright-colored tropical fishes.

Although at the last minute—as well as currently through the season—other young or tame animals may be added to the Children's Zoo col-

lection, the "line-up" for opening day will be as follows:

3 Black Lambs	Kittens
Sicilian Donkey and Foal	Rabbits
Angora Goats	Deacon, the Crow
3 White Goat Kids	Bantams
2 Skunks	White Rats
Top-knot Ducks	Pigeons
Miscellaneous Geese	Guinea Pigs
"Noah's Ark" Animals	Tame Squirrel

The Children's Zoo expects an excellent season, for its attendance has been building up each year. Last year it had 200,285 paid admissions, plus uncounted thousands of Service personnel.

As heretofore, adults will be admitted to the Children's Zoo only when accompanied by a child.

Farm-in-the-Zoo Will Open On April 28 This Year

Featuring the mechanical milking of our herd of cows, the Farm-in-the-Zoo will open for the summer season on Saturday, April 28. The variety and quantity of livestock will be considerably greater than in any previous year.

Through the cooperative interest of The De Laval Company, a complete mechanical milker unit is being installed in a new milking platform on the north side of the barn and both mechanical and hand milking will be demonstrated every afternoon.

Other new exhibits, including a series of dioramas of the handling of milk, prepared by the Borden Company for its display at the New York

(continued on page 55)

Lay Not Up for Yourself Treasures . . .

What becomes of the hundreds of thousands of peanuts that Squirrels have buried in the Bronx Zoo in the past 40 years?

Most of them have rotted—99% of them, probably. Food is plentiful and even though we human beings find it hard to stop eating peanuts once we start, Squirrels have better sense. They know when they've had enough. And they don't seem to care for buried peanuts when they can always beg a fresh-roasted one from passersby.

We *do* know what became of *one* buried peanut.

A stump-tailed Squirrel begged it from a complaisant visitor and carried it a few yards up the hillside. A few shoves of the snout, a scraping

with the paws, a tidy patting, and the cache was secure.

But not quite—as an afterthought, the Squirrel dragged over a couple of oak leaves and laid them across the minute mound. It was a convincing touch of careless innocence. Stumptail scurried off to beg another peanut.

From the middle branches of the oak tree a Blue Jay witnessed the whole stratagem. Stumptail was still making mock-timid approaches to the enchanted visitor when the Jay dropped down on silent wings, brushed the leaves aside, made a few probes with his bill and flew off with the peanut.

That's what became of one buried peanut.



Now and then—in fact, quite often—Staff Photographer Sam Dunton turns in an animal picture that is so extraordinarily good that we like to use it in *ANIMAL KINGDOM*, even though it does not illustrate an article and there is no particular excuse for it other than the pictorial. This is one of those pictures—a young Sapajou now in the collection. The picture was made in the Zoo's photographic studio and the Sapajou was most cooperative; it took a pose and kept it all through the picture-taking instead of leaping for the entrancing overhead lighting fixtures, as we thoroughly expected it would do.

World's Fair, will be installed in the rotunda of the barn. A fuller report on the Farm's new exhibits will be made in a later issue of *ANIMAL KINGDOM*.

The haywagon "taxi" between the center of the Zoo and the Farm will operate this summer as usual. The haywagon has been presented to the Zoo by former State Senator Seabury C. Mastick of Pleasantville, a Life Member of the Zoological Society.

New Members of the Society

New members of the New York Zoological Society since the last issue of this magazine are the following:

Life

Dr. William S. Ladd

Annual

Board of Park Commissioners of South Bend, Indiana	
Donald T. Carlisle	Lt. Col. Leigh M. Nisbet
Dr. Milton M. Ehrlich	S/Sgt. Willis C. Self
Mrs. J. Mitchell Hoyt	Mrs. Charles F. Slotter
Robert W. Tilney	

A Pine Grosbeak Pays

A Visit to the Zoo

The first Pine Grosbeak that General Curator Crandall has seen in the Zoo in the 37 years he has been on the staff was observed by accident late in the afternoon of January 19.

Mr. Crandall and his assistant, Miss Grace Davall, were leaving the Administration Building about 5:30 P.M. when they heard a twittering of birds in a low oak tree near the steps. The General Curator casually glanced up and saw that the noise was made by two or three Starlings and a few Juncos and White-throat Sparrows. He went on a few steps and then something made him look back; his eye had registered some odd shapes among the little flock.

Five of the birds had unusually long tails and he could make out traces of red.

"What do you see in that tree?" he called to Miss Davall. Long association with the Bird Department has taught her what to look for and how to describe it.

"Pink on the breast," she exclaimed.

Crandall turned and dashed back toward his office to get his field glass.

Knowing too well that one perching bird is worth any number that have flown away, he quickly focussed through the window and brought a gray and yellow female Pine Grosbeak into plain view in a couple of seconds.

Another two or three seconds of steady viewing were all he had. With one accord the population of the whole tree took wing and flew away. But Crandall had made his identification.

More Nursery Notes

Annie, our always surprising Blackfoot Penguin, has found a new way to manifest her individuality.

Annie, it will be recalled, is the Penguin that stole sticks from another Penguin's nest and laid up a "hope chest" of building materials at a time when she had no mate; who finally got a mate and a suitor at the same time, with the result that her Humboldt mate killed the suitor; who laid her first egg in the spring of 1943 and refused to leave her nest when the egg proved a dud; who attempted to kidnap the offspring of another pair of Penguins and wrenched the flipper from the helpless baby; who—

But the saga of Annie grows too long. The latest report is that Annie still has not weaned her own first offspring, hatched in the spring of last year. Normally a young Penguin is feeding by itself after four or five months. Annie has made no attempts to wean her baby and even though he is a young giant, fully as large as herself, she still feeds him every day. Annie takes parenthood seriously.

* * *

We are entering the spring with two true baby Penguins and one—Annie's—that is only technically an infant. One Blackfoot Penguin was hatched early in March and the other came into the world last December. It is surprising that the December baby survived, having appeared so late in the season when the dangers of cold rains and snow are multiplied. However, it was well sheltered by its parents during the first critical two or three weeks, and is a vigorous and healthy youngster.

* * *

Two young Indian Blackbucks were born in early March and may be seen in the Blackbuck Enclosure. A third baby, slightly larger, belongs to Mary, an embarrassingly tame Blackbuck. It was born unseasonably on January 4 and because of the cold weather was removed immediately to a sheltered compartment in the Animal Hospital.

Two Central American Agoutis, sleek miniature editions of their mother, were born in the Small Mammal House on March 13.

PUBLICATIONS OF INTEREST

RAYMOND L. DITMARS: *His Exciting Career With Reptiles, Animals and Insects.* By L. N. Wood. Julian Messner, Inc., New York, 1944. 272 pp., 58 illus., \$2.50.

In this sympathetic and very readable book, Laura Wood has given an account of the life of Raymond L. Ditmars that will surely serve as an inspiration for many a youth with a love for animals and a natural or imagined "way" with them. It is a fitting tribute to Doctor Ditmars, who all his life never begrudged the time to listen to the problems and the aspirations of budding naturalists and who gave generously of his knowledge and experience. I doubt that this was ever a conscious reflection of his own early struggles, but rather the expression of a kindly disposition and an innate desire to like and be liked.

The book opens with young Raymond at the age of eight, and even then evincing a lively interest in reptiles, much to the consternation of his parents and grandparents. His difficulties in overcoming the antipathy of his family to his "strange" hobbies are amusingly told; the family eventually capitulated, though, and became his staunch supporters. His school studies terminated at seventeen, when he was employed as an assistant in the Department of Entomology at the American Museum of Natural History, after which he worked for an optical company. This was followed by a short period as reporter on the New York Times and in 1899 he became associated with the newly founded New York Zoological Park. During the next forty-two years, through lectures, work at the Park and the publication of books and articles, he acquired international reputation. His vacation trips to the tropics always provided bright newspaper stories and several of these episodes are engagingly told. Many of the anecdotes described so vividly by Miss Wood are well known, while others reveal facets of his life that are less familiar.

It is with entirely pardonable pride that his family has furnished rather glamourized accounts of several episodes in Doctor Ditmars's life. Theirs was a very closely-knit group and "Pop" was ever their idol.

The selected bibliography would appear a little misleading and unnecessary in a book of this nature and a simple listing of Doctor Ditmars's own writings might have served the purpose more satisfactorily.—GRACE H. DAVALL

AMPHIBIANS AND REPTILES OF THE CHICAGO AREA. By Clifford H. Pope. Chicago Natural History Museum, 1944. Pp. 1-275, 12 plates, 50 figures; \$1.75.

Field books confined to the animals of a state or "area" continue to be issued in considerable numbers, to the edification and joy of the increasing number who are interested in the animals of our fields, forests and streams. Clifford Pope, a Fellow of our Society and a former member of expeditions of the Department of Tropical Research and now Curator of Amphibians and Reptiles at the Chicago Natural History Museum, has produced a superlative handbook on the amphibians and reptiles of the Chicago area. Mr. Pope's facility in creating text easily assimilable by the interested amateur while at the same time completely accurate in its science, has resulted in a fascinating volume. Attractively bound in paper, with 12 plates, 50 figures and maps, it covers the salamanders, frogs, lizards, snakes and turtles of the "Chicago area," which includes counties of Illinois, Indiana, Michigan and Wisconsin, with an extreme range of 70 miles from Chicago. Fifty-two kinds of reptiles and amphibians live in this area, each of which can be determined through keys and recognition characters, while other sections under each species are devoted to the distinctions between the sexes, reproduction, habits, growth and age, food and feeding habits, enemies, economic importance, the animal in captivity, geographical distribution and occurrences within the Chicago area plus a reference or references to the most important published accounts of the species.

The habits of the amphibians and reptiles of the area treated in this volume are highly interesting and provocative and, as they are expressed by Mr. Pope, they provide a cordial and stimulating invitation to the people of the area surrounding the nation's second largest city as well as to others farther afield, to become better acquainted with the salamanders, frogs, toads, snakes and lizards that are often close to us, but because of our lack of knowledge as to where to look, unobserved.—J. TEE-VAN.

ANIMAL KINGDOM



BULLETIN, PUBLISHED BY
NEW YORK ZOOLOGICAL SOCIETY

SECTS ARE ANIMALS, *by Brayton Eddy* • CURIOUS QUESTIONS PEOPLE ASK ABOUT
ANIMALS, *by Grace Davall* • A BACKWARD LOOK AT AFRICAN PLAINS, *by Lee S. Crandall*

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York 20, N. Y.

PRESIDENT

Fairfield Osborn

FIRST VICE-PRESIDENT

Alfred Ely

SECOND VICE-PRESIDENT

Laurance S. Rockefeller

SECRETARY

Harold J. O'Connell

TREASURER

Cornelius R. Agnew

EXECUTIVE COMMITTEE

Fairfield Osborn, *Chairman*

Cornelius R. Agnew
Alfred Ely
De Forest Grant

Warren Kinney
William De Forest Manice

David H. McAlpin
Robert Moses

Harold J. O'Connell
Laurance S. Rockefeller
J. Watson Webb

BOARD OF TRUSTEES

Class of 1946

George Gordon Battle
George C. Clark
F. Trubee Davison

Jay Downer
Robert I. Gannon

Robert Gordon McKay
Fairfield Osborn

Laurance S. Rockefeller
John M. Schiff
Frederic C. Walcott

Class of 1947

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez

De Forest Grant
Eugene Holman
Warren Kinney

Henry R. Luce
William De Forest Manice
Harold J. O'Connell

Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1948

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely

Marshall Field
Childs Frick
Archer M. Huntington

David H. McAlpin
John H. H. Phipps

Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Ex-officio, The City of New York

The Mayor, Hon. Fiorello H. LaGuardia

Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

John Tee-Van *Executive Secretary*

Jean Delacour *Technical Adviser*

Sam Dunton *Photographer*

William Bridges *Editor & Curator, Publications*

Edward Kearney *Manager, Facilities Dept.*

Sanford Miles *Comptroller*

Quentin Melling Schubert, *Superintendent, Construction and Maintenance*

ZOOLOGICAL PARK

Lee S. Crandall . *General Curator & Curator of Birds*

Leonard J. Goss *Veterinarian*

Brayton Eddy *Curator of Insects & Acting Curator of Reptiles*

Grace Davall *Assistant to General Curator*

W. Reid Blair *Director Emeritus*

William Beebe *Honorary Curator, Birds*

AQUARIUM

Christopher W. Coates *Curator and Aquarist*

C. M. Breder, Jr. . *Research Associate in Ichthyology*

Ross F. Nigrelli *Pathologist*

George M. Smith . *Research Associate in Pathology*

Myron Gordon *Assistant Curator*

Homer W. Smith . *Research Associate in Physiology*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*

Jocelyn Crane *Research Zoologist*

Henry Fleming *Entomologist*

George Swanson *Staff Artist*

Associates

William K. Gregory
John Tee-Van

Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

VOL. XLVIII

JUNE 4, 1945

No. 3

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York 20, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York 60, N. Y. Title registered with United States Patent Office.

Subscription, \$1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

Forest Destruction and Wildlife

Truth seems hard to come by. Rarely does it shine out like a beacon on a mountain-top—usually it is will-o'-the-wisping in a lower valley.

As a case in point, has the public got the facts concerning the destruction of the forests which are essential not only for wildlife preservation but also for balanced and adequate water supply and the needs of many basic industries? The air is filled with propaganda or, shall we say, with inspired or prejudiced information, in the form of magazine articles as well as motion picture films, prepared and sponsored by representatives of the commercial lumber interests. This material gains widespread circulation, is read or seen by large sections of the public that are led to conclude that all is well with our forests.

The facts concerning the forest situation are clearly presented in the last annual report of the Chief of the United States Forest Service. This report indicates that the rate of destruction, even making allowance for war demands, is far greater than the rate of replenishment and that the situation in regard to forest depletion is rapidly becoming more acute. Do these facts receive widespread circulation? Is the public as a whole informed regarding them? Not really. The potent machinery of propaganda is generally used by special groups seeking special purposes.

Occasionally the beacon flashes out—some government official makes a statement that draws general attention, or an authoritative article appears such as the recent one by William Vogt, Chief of the Conservation Section of the Pan American Union, telling of conditions in Central and South America where, in many republics, the velocity of destruction is even greater than it is in the United States. It reminds one in a way of the oncoming of war in Europe. Many people knew it was inevitable but no concerted action was taken to prevent it.

There are innumerable agencies, governmental and private, that have the facts and realize the seriousness of the situation but whose efforts in the matter of getting the truth over to the public are not coordinated and therefore not fully effective. These conservation forces naturally have their own varying objectives and could not be expected to forfeit anything of their own individualities. Nevertheless, there is one issue in which they should all join together, namely, informing the public concerning the crisis of the forests. This can be accomplished by the establishment of a central agency specialized in the technique of disseminating facts. The situation cannot be saved unless supported by organized public opinion. The Zoological Society is vitally interested because the present trend is a threat of the first magnitude to wildlife.

Fairfield Osborn

IN THIS ISSUE

"Petunia," Pet Skunk of the Children's Zoo	A Brilliant Flash — That's the Manakin's Display
Sam Dunton COVER	Lee S. Crandall 67
Four Years of Africa-in-the-Bronx Lee S. Crandall 59	The Key to Question House . . . Grace Davall 70
The Subtlety of <i>Leucochloridium paradoxum</i>	About Bull Snakes . . . Earl Jackson 75
Ross F. Nigrelli 61	Why Should I Join the Zoological Society? . . . 80
Insects Are Animals Brayton Eddy 62	Problem of the Invisible Baby Fish William Bridges 82
	Behind the Scenes: News and Notes 83



It might be in Africa—but actually this is a scene around the Water Hole in Africa-in-the-Bronx, where Chanler's Mountain Reedbucks, Bushbucks and Nyalas seem to live at peace with Lions.

Four Years of Africa-in-the-Bronx

By LEE S. CRANDALL

IN THE WORLD of Zoology, as in other spheres, few projects develop exactly as planned. When we opened our African Plains exhibit on May 5, 1941, we found ourselves abroad in a field of animal management entirely new to the Zoological Park. Never before, in the more than forty years of our existence, had we attempted mixed groups of mammals and birds on anything beyond a tiny scale. We had to feel our way and our most cautious groping could not save us from all of the many pitfalls that beset such a course. And yet, after four years of Africa-in-the-Bronx, we feel free to claim a real success. The area, carpeted with rich, strong grass, is certainly one of our best-liked and most popular exhibits. But for the members of the animal departments, there is a satisfaction even greater than obvious visitor enthusiasm. At last, we have developed a group of mammals and birds that will live together amicably, under reasonable control, that so far have reproduced their varied kinds beyond our expectations and that at the same time, yield an unsurpassed return in spectacular appeal and educational value. That this final happy outcome does not check exactly with our original plan is a matter of no consequence. We have had a great deal of priceless experience at no great cost and we are established, at last, on a perfectly sound and workable basis.

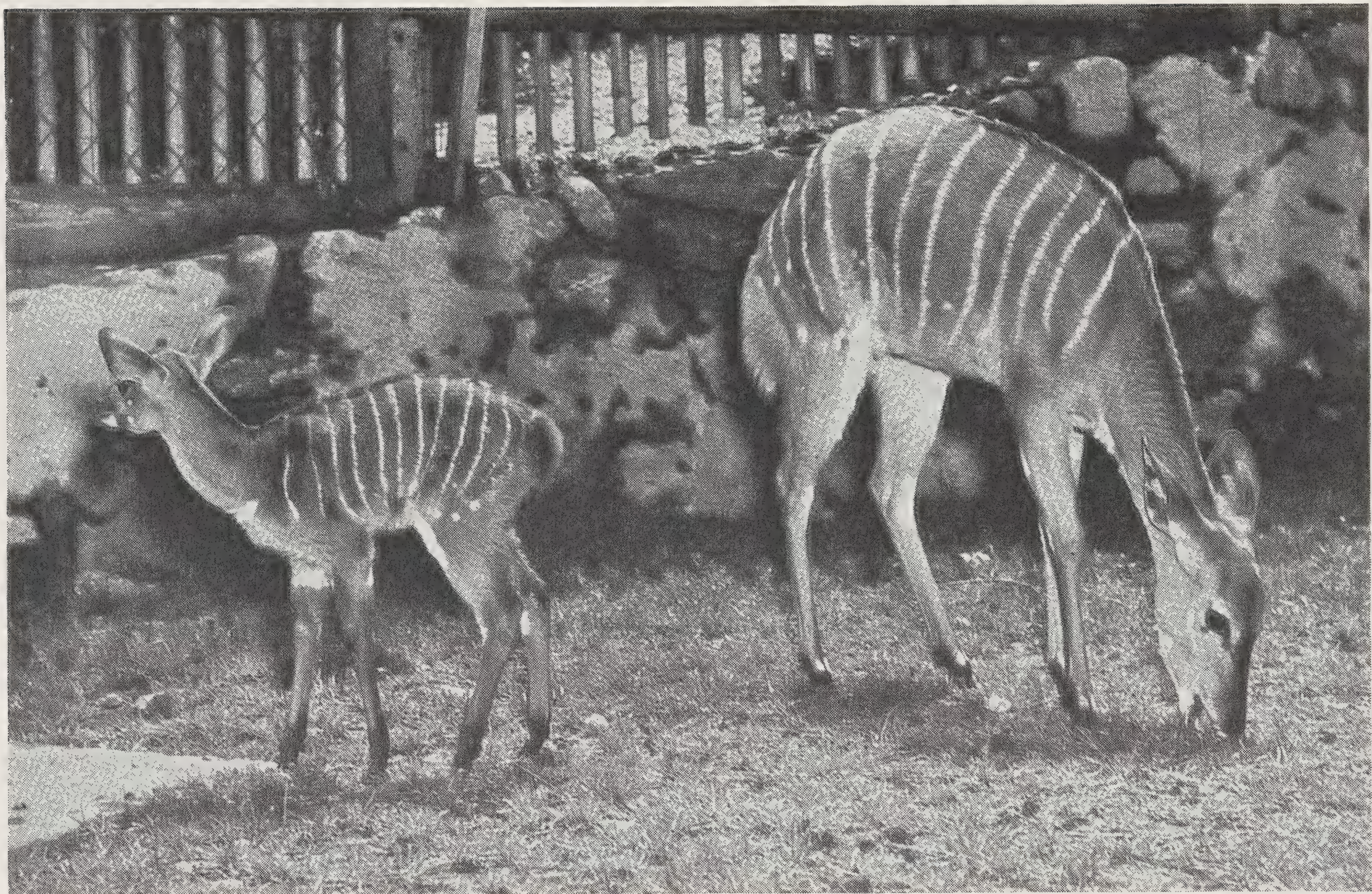
In the beginning, our ambition to accomplish the spectacle of the ages led us to include species that, for various reasons, were unsuitable.

The Zebras were the worst. The stallion was a callow yearling, too young, we thought, to be dangerous, and the two mares were staid old-timers from the Zebra House. From the very first day, the stallion proved himself a complete fiend. Ears back and teeth bared, he drove fiercely at first one companion, then another, and

Looking back at our big Plains exhibit, it seems that most of the plans had to be modified—but the result is a magnificent, and workable, miniature Africa.

only the antelopes' fleetness of foot saved them from annihilation. Unable to accomplish his designs on Bushbuck or Lechwe, he set about systematically hunting down the Wart-hogs. These grotesque creatures had devoted the first few days of their liberation to digging a huge burrow in an embankment. By the time the Zebra had worked down to the level of such lowly prey, they had completed a dug-out that provided perfect safety. Having failed in several attempts to cut off the Wart-hogs as they dashed for cover, the Zebra developed the patience of a hungry Leopard and spent hours waiting for an opportunity to pounce on them as they cautiously emerged. Eventually, he actually succeeded in caving in a section of the burrow and doing the male Wart-hog a slight injury, from which he soon recovered. But it did result in the removal of all the Zebras, from which we had learned a number of things: male Zebras, once weaned, are likely not to be nice in mixed company; mature mares are not always to be trusted; Zebra feet are hard on small areas of turf, and anyway, they are too big for a miniature Africa! Incidentally, the recuperated Wart-hog and his mate were not long in finding themselves back in the Kangaroo House. The erstwhile invalid, rid of his Nemesis, soon developed an antipathy for anything that would run and pursued whatever it might be with ludicrous but determined agility. Moreover, a whole series of caves threatened a general collapse of the entire area.

The Elands, quiet enough after their ox-like fashion, made no trouble but we soon realized



The newest baby Nyala is a brightly-striped youngster that is gentle and unafraid, and will be a handsome addition to the African Plains when he is turned out with his mother. At present the baby and the mother are being exhibited in the feeding corral at the entrance to the Plains.

that their great bulk made them unsuitable. The splendid young Common Waterbuck, meanwhile, had been gaining rapidly in size and confidence and finally managed a transfer to the Antelope House by the simple expedient of chasing a too-trusting keeper into the Water Hole.

And so it went, our little colony rapidly diminishing and smaller. One evening, a small boy who had decided to take a short-cut across the Plains, had to be rescued from the cock Ostrich by a watchman passing on his rounds. That meant only female Ostriches in future. Then came the only real tragedy. In a ten-minute interval when no keeper was about, a lovely two-year-old male Nyala was killed, perhaps by his father, perhaps by a male Bushbuck, but most probably by a Cape Hartebeest. We never were quite certain, but at any rate we determined to risk no more accidents. The Hartebeest was removed to the "Plains Annex," a large enclosure just west of the Plains proper, where he behaves well with Zebra mare, Elands and elusive Aoudads. The male Bushbuck was confined to the shelter and the feeding corral.

Now only the male Nyala, a handsome and

docile animal, is allowed the freedom of the Plains. With him run his original mate, a daughter of breeding age, a yearling female and two lovely white-striped babies. They are an affectionate and closely-knit family but are perfectly friendly with three female Bushbucks and two tiny youngsters, as well as two female Rooi Rheboks and a female White-eared Kob. Thus we have succeeded in establishing breeding herds of both Nyalas and Bushbucks and can swell their numbers as required by adding females of medium-sized and small species. Last year we added a yearling male Blesbok; this year, rather than risk him again, he will go to the Annex, along with larger game.

Birds in the group include a South African Ostrich (a hen), South African and West African Crowned Cranes, Paradise, European and Demoiselle Cranes, Crowned Guinea-fowl and a Marabou Stork. They cause no trouble and add just the right touch of color and movement required to give the scene a sense of reality.

Sam Dunton's superb photograph (the frontispiece of this article), made from the eastern edge of the Water Hole, points the necessity of men-

tion of the Lion Rock. This lies between the Plains proper and the Annex to the west and is separated from them by a well concealed moat, twenty feet wide and about eighteen feet deep. It is inhabited by three very fine adult male Lions, now about seven years old. Free from any disturbing feminine influence, they spend their days together in complete friendliness but at night they are housed and fed in separate compartments. Frequently they join in awe-inspiring

choruses, sometimes so terrific that the Rock itself seems to shake. And yet the timid creatures of the Plains, which should be warned by some instinct that Lions are their natural enemies, pay little heed. Sometimes, when the dread vibrations seem to threaten ear-drums far less sensitive than theirs, they may deign to raise their heads and listen for a moment. But always they quickly return to their own affairs and leave the Lions to their fruitless uproar.

The Subtlety of *Leucochloridium paradoxum*

By ROSS F. NIGRELLI

Any practicing naturalist can astonish his friends with stories of complex life cycles and intricate food chains — Darwin's classic example of the relationship between cats and clover is a familiar example. But the parasitologists can tell the best stories, because some of their little animals will go to almost fabulous lengths to perpetuate their kind.

Take *Leucochloridium paradoxum*.

It is a minute parasite, a fluke, and its life fluctuates between a bird in a tree and a snail on the ground. Now admire the subtlety of its path.

Its reproduction begins in the intestine of a baby bird — a Sparrow, for example. The adult flukes lay vast numbers of eggs which pass out in the nestling's excrement and are thus strewn over bushes and on the ground.

Along come snails — many kinds — and feed upon the excrement. That is the end of the road for most of the eggs; they are simply eaten and digested. But in *one* kind of snail the eggs hatch into wriggling larvae and start their journey through the snail's body. They are pretty little things at this stage, even though they can only be seen under a microscope — striped green and white, with bright red tips.

These decorative mites burrow through the tissue of the snail and crowd into the tentacles. Such vast numbers of them jam into the delicate, extensible "feelers" of the snail that the tentacles are swollen and cannot be drawn back under the shell.

The skin of the snail's "horns" is stretched taut

and thin and through its transparent sides the bright red tips and the green-and-white stripes of the parasites are clearly visible. They wriggle continuously and thus the tentacles seem to move and twinkle with ruby light.

What more likely to attract the attention of an adult Sparrow, perched on a limb and spying out the ground for its hungry nestlings?

The Sparrow flies down, the snail in alarm draws itself back into its protecting shell — and only the weaving, pulsating, tempting red tentacles remain exposed. The Sparrow nips them off.

If the Sparrow happens to be hungry itself, it may swallow the little bags full of parasites — in which case, again, it is the end of the road, for the strong digestive juices of an adult Sparrow destroy them.

But if it unselfishly carries them back to the nest and pops them into the mouths of its ravenous nestlings, the chain is complete; in the milder secretions of the nestlings' intestines, the larvae quickly develop into adults — which lay more eggs — which pass out in the excrement — which the right kind of snail eats — and the cycle is beginning all over again.

What happens to the snail who has been de-tentacled?

Nothing much; it simply grows new "horns," which fill up with parasites again, which another Sparrow nips off. And so *Leucochloridium paradoxum* continues to survive.

The paradox is that it has to be eaten in order to survive.

Insects Are ANIMALS

By BRAYTON EDDY

THE New York Zoological Society is pioneering when it undertakes to establish an Insect Department at the Zoological Park. There is no known precedent for it in this country. Sporadic attempts have been made by private individuals, public museums and government agencies to exhibit live insects, but these exhibits have lacked permanency and often they have lacked purpose. Only in London and Berlin before the war have any considerable number of insects competed with reptiles, birds and mammals for attention at a Zoological Park.

Which is rather strange, when you stop to think of it.

Here is a group of organisms that is so intimately connected with ourselves that we cannot escape them. They inhabit the air about our heads, the earth beneath our feet and the waters bounding the earth. They are found on the highest mountain peaks, within the darkest caves, and even 1,000 feet under Lake Superior. They survive in the mud of shallow hot springs which reach a temperature of 122° Fahrenheit, and frozen in icecaps of the far north. Only in mid-ocean are their numbers relatively sparse, yet they breed on floating vegetation in the midst of the Sargasso Sea.

Perhaps the unpleasant connotation of their name has kept them from being more extensively exhibited. Popularly they are known as "bugs," yet actually only a certain group of them belong in this classification. They are not mere bugs, creatures to be despised, enemies of ours that only delight in chewing up our trees, our furs and even ourselves. They are far more than that name implies. Their lives are crammed with amazing interest, charm and complexity. Their shapes are legion. They are animals in the truest sense of the word, dominant animals.

To many persons, insects are just "bugs," and bugs are something unpleasant. But our new Department has hopes of changing a good many of those mistaken ideas.

Insects may be thought of as standing astride the fulcrum of the animal kingdom, able to throw their weight in any direction. No other animal group, by pollinating plants and cultivating soil, contributes so much to the general welfare; yet no other group, through its competition for food and living space, demands quite so much in return. Insect lives are so enmeshed with other forms of life, both animal and plant, that their activities affect for good or ill the entire organic structure.

There are some commentators who claim that ultimately insects will inherit the earth. And they have a strong point to their argument. Numerically insects are already supreme. Over one million species have been named and new ones are being discovered almost daily. Already insect species are said to outnumber plant species two to one, and the odds are even greater when it comes to a comparison with other animals. Therefore the total known species of insects upon this earth is believed to be greater than the total known species of both plants and other animals.

But it is not alone in species that insects excel. Individuals within a species reach astonishing numbers. In favorable times there may be as many as 340 Aphids to a leaf on a tree bearing 100,000 leaves, or 15 Chinch Bugs to a plant in a wheat field growing one million plants to the acre. A queen Honeybee in good production form has been known to lay 3,000 eggs a day, whereas the potential increase of a Cabbage Aphis is almost unbelievable. Yet two eminent scientists have come to very much the same conclusion



Honeybees are a hobby of Brayton Eddy, our new Curator of Insects and Acting Curator of Reptiles. The purpose of this picture is to introduce Mr. Eddy to the membership of the Society; he is at the left in the photograph above, which shows him inspecting an apiary in Rhode Island.

regarding it. Although a single Cabbage Aphis weighs but little more than a milligram, its progeny in ten generations—provided they breed normally and all survive—can exceed the weight of the total population of China. And that statement was made before the war!

Granted that there are several arguments in favor of the supposition that insects will inherit the earth, nevertheless these arguments fail to recognize that insects are their own worst enemies. They are not united. They are divided against each other. Some 12% are said to be parasites, some 16% are predaceous—most of them being parasitic or predaceous upon their own kind. Add to these figures another 17%

which are scavengers and the picture does not look so black for the human race.

The total number of insects which may be regarded as major pests are comparatively few. Perhaps a hundred fall in this category. The worst offenders come from abroad. Away from their natural enemies and in a region of specialized agriculture, they are capable of enormous damage. Although only about one-half of one percent. of all insect species are directly injurious to man or to his crops, nevertheless they cause an average crop loss in this country of approximately 10% each year.

One of the important functions of the new Department of Insects, as it operates at the Zoo-



A Monarch Butterfly resting on a thistle is a familiar sight in summer fields, and it will be one of the tasks of the Department of Insects to recreate such sights in Zoo exhibits.

L. M. Chace Photo

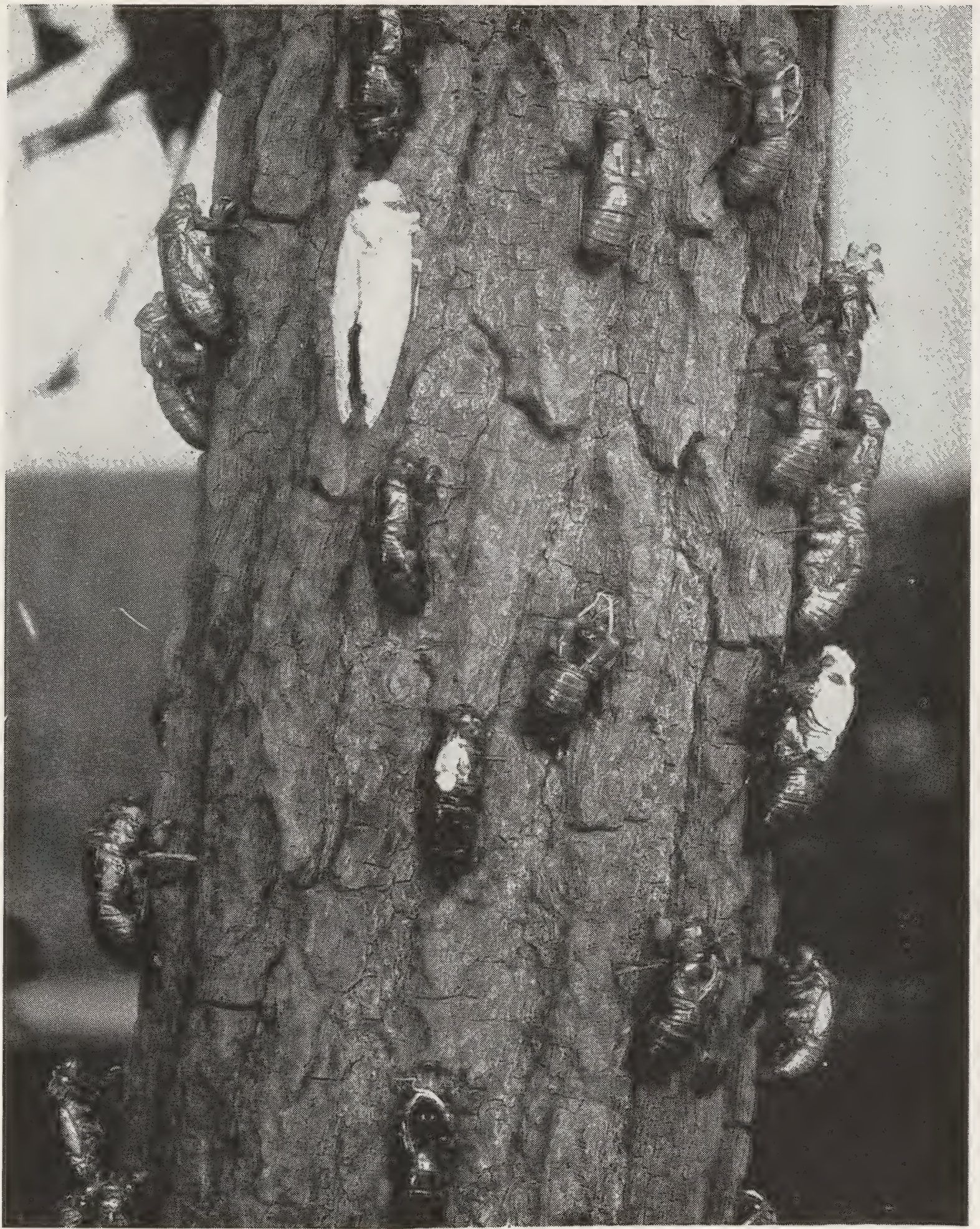
logical Park, will be to help the general public to distinguish between insects which are destructive and those which are beneficial. The checks and balances of nature will be made demonstrable so that as individuals we will be less likely to work at cross-purposes. There are many native insects that aid in the policing of our gardens, and many others that have been imported by the Federal Government for our common good; but unless we recognize them and come to appreciate their value, we are likely to impose upon them an early and a violent death.

In the Insect House that has been planned for the post-war period, there is provision not only for the display of innumerable live insects but also, in separate wings of the building, for a few native vertebrates that feed upon them. Frogs and toads, salamanders and small turtles, snakes, birds and mammals of a sort, constitute their

natural controls. The assumption will be that if all glass fronts were removed, the insect population would have small chance for survival. It would have to run the gantlet of both vertebrate enemies and aggressive invertebrate enemies from within its own ranks.

Biological controls, as explained above, offer one means of curtailing insect populations. Their chief advantage lies in the fact that they operate continuously and at no added cost, but unfortunately they are not always effective. For this reason, and because biological controls of many insects are not yet known, it usually is necessary to employ some chemical for assured crop protection. Lead arsenate, rotenone, cryolite and many other products are in general use today, but a whole new world of organics and synthetics is being discovered that promises widespread hope for the future.

The emergence of the Seventeen-Year-Locusts in various parts of the country is a subject of perennial interest and the Department of Insects will be prepared to answer questions. *A.M.N.H. Photo*



Not only is it the intent of the Department of Insects to keep abreast of the times in the use of these newer materials, but also it plans to experiment with other materials as they appear and to attempt to find new uses for old reliables. The live insect displays will be a front for experimental activities of many kinds that will go on behind the scenes.

Since there will be many social insects on exhibit from time to time, opportunity for studies in animal behaviorism will be offered. It is hoped that a limited number of graduate students from nearby institutions will take advantage of the facilities provided and record the results of their findings in scientific journals.

Educationally the Department of Insects will function in many spheres. There will be chatty radio talks about insects on display, booklets giving information on insect control problems,

and public meetings where related topics may be discussed. Although the department will not be staffed by specialists in particular fields of entomology, but rather by general entomologists, it will be prepared to identify the more common insects submitted to it. Since descriptions of specimens by letter or telephone are often misleading, actual specimens should be brought or mailed to the Administration Building and precautions taken to assure their arrival in good condition. Mailed specimens should be dead.

It will not be possible to examine real estate property to determine the cause of damages, nor actually to administer control measures. Inquirers will be referred to concerns that do this service.

Obviously the various aims and hopes of the new Department of Insects cannot be realized at once, or even after a considerable period of time. There is a staff to pick and a building to be

erected. Plans for the building have already been projected, but details necessary to an effective display of insects, to lighting and servicing cases, and to convenience in handling crowds cannot be worked out in a minute. They require careful study and experimentation to avoid unnecessary mistakes. The finished product must be as near perfect as is humanly possible.

The first subject for display was submitted on April 8. It consisted of two Black Widow Spiders that had been found on Long Island. To be sure, they were not insects, since their eight legs disqualified them, but the possession of deadly poison glands placed them in the nature of a major attraction. Because they are inclined to be cannibalistic, each spider was placed in a separate bottle and kept under observation. When they consumed the flies offered them for food, they were placed on public display—bottles and all—within a reptile case above the Tarantula exhibit. On April 12 a “blessed event” occurred in the form of a Black Widow egg capsule, which was spotlighted in a tight glass box against the time when the eggs would hatch, around May 6.

A Honeybee exhibit is planned for July in the Reptile House lobby, which at present is used as a turtle pen. Honeybees are not only an assured attraction, but also they are of great service to mankind. By their industry they make fruitful

our orchards, berry patches and vegetable gardens; even during the destructive days of war they also serve, for they provide a natural sweet against the war-imposed sugar shortage; and they furnish wax to waterproof uniforms and speed our ammunition on its way to the enemy. Of all social insects, they alone are subject to easy manipulation.

It was intended that the bees should go outdoors to get their pollen and nectar, but this idea was changed when it was determined that honey plants were scarce in the Park and that ice cream in the hands of small youngsters might be taken in substitute. It is now intended to keep the bees confined within a glass observation hive where all their varied activities may be noted, allowing them access by an overhead route to a glassed-in garden spot at the opposite end of the lobby. Between hive and garden, space will be reserved for an exhibit of products which Honeybees have made possible.

The Honeybee exhibit will be a forerunner of what may be expected when the Insect House is completed. There are exciting times ahead. Live insects will constitute a majority of the public exhibits in the new structure, but it must be remembered that *back of the front* both research and experimentation of a very practical nature will be conducted.

The Fish that Can't Abide a Big Tank

FISH HAVE THEIR PECULIARITIES—their quirks of personality. For 13 years the New York Aquarium has struggled with the whims of a Velvet Cichlid (*Astronotus ocellatus*) that can't abide a big, roomy, comfortable tank.

As long as it can live in a tank 1 x 1 x 2 feet, the fish is happy and contented. Time after time, over the years, it has been given vastly bigger quarters, either alone or with other fish, and invariably it sulked, turned savage, fought its tankmates and refused to eat. Once it went five weeks without eating, until the Aquarium people gave in and put it back in its little tank.

The trouble is that tank size has a definitely limiting effect on the growth of fishes, and the midget tank is theoretically too small for a Velvet Cichlid that should reach a length of about 12 inches. Its growth will probably be stunted by its self-imposed confinement. It is 9 inches long now, and apparently has not increased for years.

A Brilliant FLASH— That's the Manakin's Display

By LEE S. CRANDALL

SIXTEEN YEARS AGO, Dr. Frank M. Chapman published a charming book called "My Tropical Air Castle." In it (pp. 175-7) appears a description of the courtship display of the Red-headed Manakin. In the Zoological Park, we call our birds the Yellow-thighed, for they came from western Costa Rica and represent a form of *Pipra mentalis* slightly different from the one found on Barro Colorado. In any case, we may certainly agree that the species is a particularly enchanting member of a lovely group. Doctor Chapman's account of the Manakin's antics is so fascinating that one feels certain that if the bird in the flesh could surely be seen, a trip to Panama would be justified indeed.

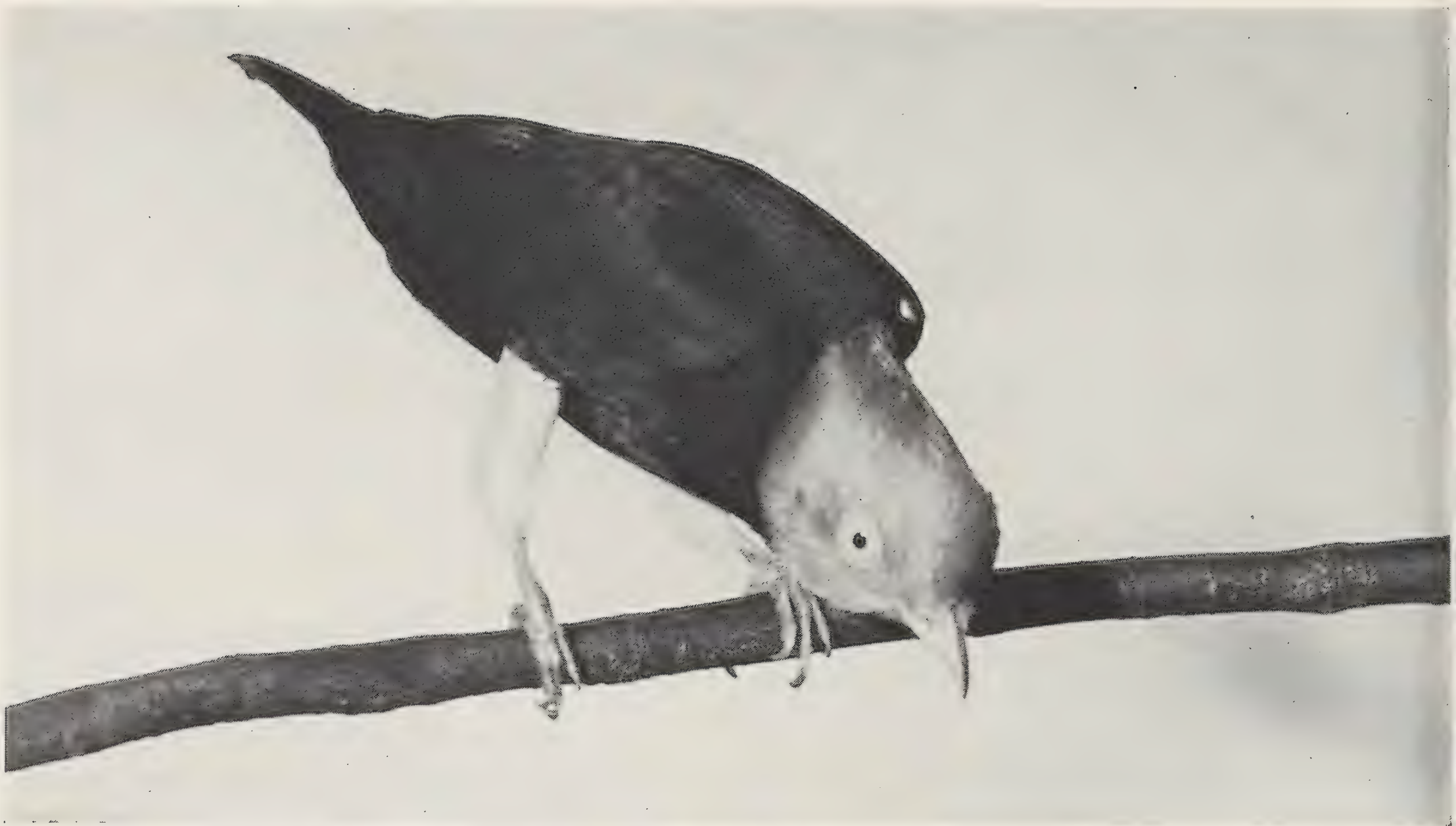
Yet, to the credit of our Bird House staff, it must be said that a visit there will bring the same reward. For in the glass-fronted aviary, in the Main Hall, which still houses hummingbirds, lives a pair of Yellow-thighed Manakins. The warm, humid atmosphere and dense tropical vegetation are ideally suited to Manakins and since these two were brought from western Costa Rica in 1942 by Charles Cordier, they have kept in perfect condition. A large printed label on a black and yellow pedestal calls attention to the marvel within. Thousands of visitors have seen what the label promises, though few of them have traversed the bush of Central America.

As you stand before the glass, you may well feel yourself transported to the jungles of Panama. Your attention is caught by a tiny black bird, touched with bits of scarlet and yellow. The cage is sound proof, so that you cannot hear the curious buzz of wings and the loud snapping

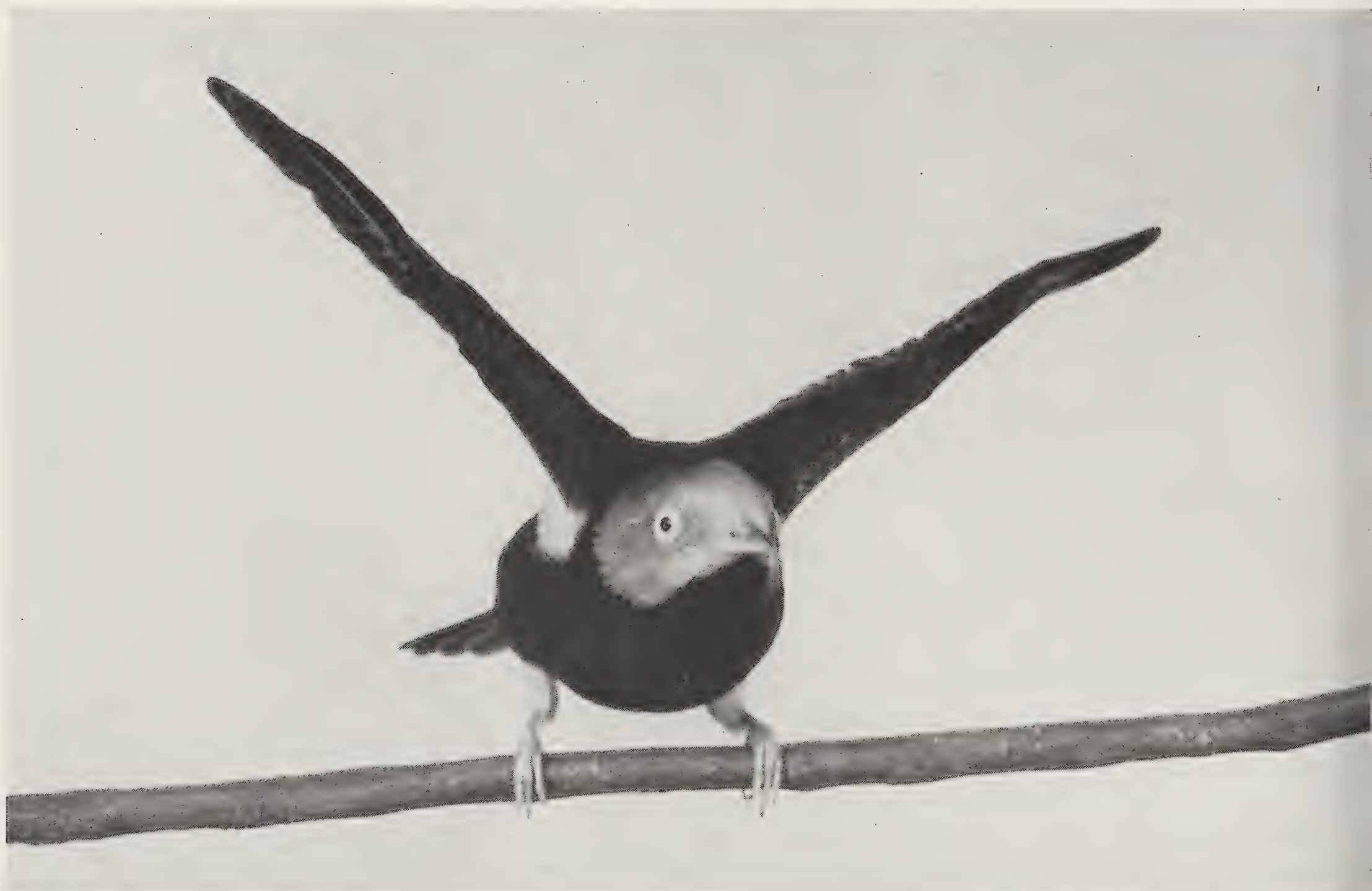
Thousands of visitors have viewed this colorful courtship but the most interested spectator of all is the somber-hued female. She is full of curiosity.

sounds that accompany the movements of this brilliant creature. But the glass is clear and there is nothing to obstruct your vision.

You see him sitting perfectly still on a thin, horizontal branch. His black, shiny body is stiff and taut, tilted well forward, with scarlet crown turned down. The legs are straight and rigid, yellow thighs exposed to the utmost. The stubby tail, almost ridiculous, is held upright. Long before you could read what is written here, there is a movement, fast as light. The little bird has reversed his position in a split second, turned his back and now is facing you again. You cannot believe what your eyes have barely seen, and to convince you, he repeats the process, perhaps five or six times. Now with a speed you cannot follow, he darts two feet away, freezes, then is back again, so fast you cannot tell whether he flew or leaped. Then begins the most curious phase of all. Holding his wings tight at first but later spreading them widely, he vibrates backward along the perch for a foot or more, leaps to his first position and then repeats. "Vibrates" is the proper word. The stiff little tail shakes jerkily as the golden thighs transmit the shock of tiny leaps. For while at first you cannot tell how it is done, you finally see that the movement is accomplished by a series of straight-legged jumps, so small and so very rapid that the little body seems to move in a perfectly straight line. The



At the beginning of his display, the Yellow-thighed Manakin sits perfectly still on a thin, horizontal branch. His black, shiny body is stiff and taut, tilted well forward, with the scarlet crown of the head turned well down. When he assumes that position he is ready for instant action.



Much too fast for the human eye to see, the Manakin goes into this stage of his display, in which he flexes his wings and flips back and forth on the perch, now facing the observer, now turning his back. These pictures were made at a camera speed of 1/1000th of a second to stop motion.



The most curious phase of the display is this, in which the Manakin “vibrates” backward along the perch for a foot or more, then leaps to his first position and repeats. The motion is accomplished by a series of straight-legged little jumps, all for a short distance and very rapid.

wings, usually spread at the end of the run, may very well aid the performer in keeping his balance.

Today as I watched, the female came to look on, too. She is a shy creature, dull green in color, with very large eyes. Perhaps it is these that give her a look of complete innocence. Certainly she was interested enough to cause her to move to the lower end of the display twig. But somehow she seemed motivated only by curiosity. Her great

dark eyes were fixed on the bird she must have known to be her mate, but it was as though she could not imagine why he acted so strangely. When he jerked down the twig, she flinched as he neared the end of his run. When he darted back to his starting point, she obviously felt an impulse to follow, though she did not do so. Sometime she will act on that impulse. No one has ever bred a Manakin in captivity but there always has to be a first time.

The Key to Question House

By GRACE DAVALL

CAN A kangaroo swim? Do animals ever get varicose veins? Do monkeys become bald? What are crocodile tears? How long is the tail of a hippopotamus? How can I teach my pet bear to skate? With questions like these, to the amount of several thousand each year, presented personally, by phone or by mail, monotony can scarcely find a place in the routine of the office of the General Curator at the New York Zoological Park. Undoubtedly the variety of questions cannot be duplicated elsewhere except, perhaps, in similar institutions.

It is not always possible to determine what elicits some of these queries and sometimes we might be inclined to doubt their importance or sincerity, but all are answered on their face value and probably there is some real reason behind each one. At least, we hope so. But why, we cannot help wonder, must somebody know whether or not turtle eggs bounce, or whether cats have tonsils? Finding the reason behind some queries often helps in the solution. A recent lengthy phone conversation could have been cut to a minimum had the caller stated his problem honestly at first. Instead, he made inquiry about the relationship of squirrels to the order Rodentia, on which point we attempted to enlighten him. Several minutes of conversation followed before we came to the realization that the gentleman had come into possession of a freshly killed squirrel and was endeavoring to dispel his own doubts about its edibility, considering that it was so closely related to rats. Perhaps that one should be charged to the war and the consequent meat shortage. To the war and cigarette scarcity we must also attribute a flood of calls from gullible individuals who have been beguiled into phoning

Ask It and We'll Answer

In mid-June the Zoological Park will inaugurate Question House, a service that will attempt to give the best available answers to any question about animal life. The service will be free.

Question House will occupy an attractive room in the center of the Zoo.

We have no illusions about the magnitude of the job we are undertaking—but we are not entirely without experience. Miss Grace Davall, Assistant to the General Curator, has been answering animal questions for years. In this entertaining article she figuratively turns over the key to Question House to its new staff—at least, the key to some of the questions that interest the public.

RAYmond 9-2090 on the promise that orders for Camels would be filled at that number.

Occasionally, though rarely, eccentrics phone or mail in questions or comments not entirely sensible, but as a rule they have the good grace to remain anonymous. A recent phone inquiry was a request for our opinion on how long it would take for a snake to digest a 500-pound pig. Since we knew of no snake large enough to attempt such a meal we declined to answer the question and the information seeker immediately capitulated and said he would settle for a 150 pound pig. He had merely been calling all around to note the reaction of various authorities!

It is obvious that our replies often settle wagers; the seriousness with which some questions are put would indicate possible loss of face in addition to financial involvement.

In recent months there has been a natural flood of letters from barracks, foxholes and government hospitals, to which we are happy to pay particular

attention. Sick or well, our men in Service always seem to find the time for discussions and arguments. Natural history subjects, which appear to take an important place, produce innumerable controversial points. In fact, quite a few Servicemen are regular correspondents. A query that frequently reaches us relates to the occurrence of lions in a small portion of Asia, as well as Africa, and the restriction of tigers to Asia. Relative strength of these two animals is often questioned, with a request for our opinion as to the outcome of an encounter between them. Longevity comes in for its share and to the remote corners of the world we send assurance that an elephant is old at fifty years, the best authentic record for a parrot is about fifty-five, and tortoises do *not* live to be five hundred years old—probably not even one hundred. The old favorite “Is a zebra white with black stripes or black with white stripes?” crops up frequently, also such sticklers as “How many mouse power would it take to make one horse power?” “How fast can an ant travel?” “Do horses have eye brows?” and “Why does a camel’s breath smell?” Then, of course, there are the hundreds of requests for identification of mammals, birds and reptiles seen in remote places. Some are easy of solution, others may at least be run down to groups, but how to identify what amounts to a brown snake, two feet long or longer, seen “somewhere in the Pacific?”

Never a day passes that we do not receive visitors, phone calls and letters about pet animals. There is the owner of a parrot that suddenly begins to lay eggs, after masquerading for years under the name of “Davy” or “Dicky Boy.” Or the woman who called excitedly on the phone to say that her turtle, recently acquired, had been lost in the apartment and where was the most logical place to look for it? Or still more on the humorous side, the call about a turtle that had fallen off the porch and soon afterward laid an egg, neither fact in itself particularly startling. But this person was quite certain that the turtle had been injured in the fall, had probably laid her egg prematurely and somewhere in the process had lost her maternal in-



stinct. For no matter how often the owner put the egg under the turtle she refused to sit on it, and what *should* he do?

Queries about the everyday care of pet canaries, parrots, turtles, alligators, etc., including minor mishaps and illnesses, are routine affairs but there is a pleasant satisfaction associated with this phase of our work. Most people are very fond of their pets and are anxious to do everything in their power to care for them properly. Some are diffident in their approach; others, completely confident of sympathetic attention, regale us with endless tales about their particular pets. But the sincere gratitude of all is a pleasant reward for whatever efforts we might make in their behalf. The solicitousness of some pet owners, however, knows no bounds, as for instance the possessor of a Blue Racer that was not taking too kindly to captivity and handling. The amateur herpetologist wrote that he did not in the least mind being bitten by the snake but would we please assure him that no harm would come to his pet from these encounters? And there was the woman who called to tell us how she was taking the best possible care of her turtle but it did not seem to be responding properly. When she picked it up its limbs and head hung limp; was this a normal manifestation during winter hibernation? She finally admitted, quite reluctantly, that an increasingly unpleasant odor was associated with the creature. It is to be hoped that she followed our suggestion to deposit the turtle in the nearest incinerator at the earliest possible opportunity. Unfortunately, also, we were not able to be of much help to the pet chipmunk whose owner wrote that it was suffering from constant hiccoughs. The letter, coming from out of town, was delayed in reaching us and a week had elapsed between the date of writing and receipt at the Park. By that time, we felt certain that the chipmunk had either recovered or succumbed. And what could we have suggested, other than a sugar pap?

Strangely enough, our office has seasonal rushes. Spring brings us the oft-repeated query about deer shedding their antlers annually and summer brings every bit of snake lore out for an airing. Folks must constantly be assured that there are no poisonous water snakes in New England, that snakes do not swallow their young for

protection, do not steal milk from cows, "sting" with their tails or tongues, form hoops and propel themselves in this manner, ad infinitum. Then, of course, there is the frequent identification of all manner of wild creatures found on vacation jaunts in the country. Seasonal, indeed, is April Fool's Day, which would result in a hopeless jamming of our Park's switchboard were it not for the cooperation of the Telephone Company. All of our incoming calls on that day are covered by their special operators, equipped with lists of the Park's personnel — which do *not* include the names of Messrs. Fox, Wolf, Fish, Bear, etc.!

Spring also brings its baby bird problems. Many of these youngsters fall too early from the nest but some are fortunately found and kindly ministered to by human foster parents, who rear them past the critical feather-growing stage, then liberate them. One such little waif, a sparrow, was picked up by a business man. A complete novice in the art of bird-rearing, he called us concerning every minute detail of the baby's care. Hourly calls were followed by daily calls, the gentleman needlessly assuring us that the rearing of a baby bird was no trifling matter. After a week of this, the real and final worry developed: must the baby bird be taught to fly? He hadn't so much minded the early rising to care for and feed the little fellow, but darned if he would stand on a chair, flap his arms and jump off, just to teach it how to fly!

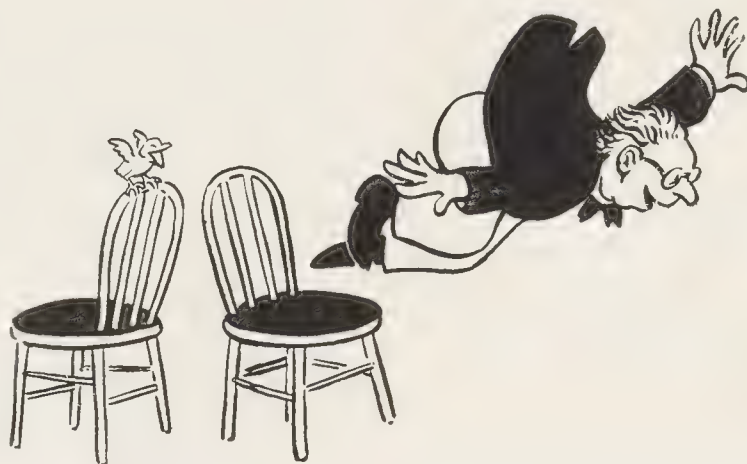
Rarely does a lunch hour pass, especially a rainy day lunch hour, without calls from office or factory groups. From them, probably more than from any other source, comes our year-round stand-by: what is the gestation period of elephants? The nine-year myth is so firmly imbedded in the minds of many people that it is hard to shift. So familiar are we with the question that we are able to anticipate it, no matter how subtle the approach, or how delicate. Our answer of twenty to twenty-two months has undoubtedly lost or won many a wager. Less helpful is our reply to the oft-repeated request, very often a lunch hour item, for a specific name for a female wolf. Our best and only suggestion, "she wolf," does not always appear to satisfy and those in-

quiring are left to their own devices to conjure up an appropriate name for some lusty lady under discussion.

Not all requests, of course, are made to satisfy personal whims. Social and economic subjects come in for a large share of attention. Sparrows in airplane hangars, gulls on airport runways, skunks under houses, squirrels in the attic and pigeons all around — these problems must be dealt with, each with its individual ramifications. And none is easy of complete solution. One downtown business house thought it had the pigeon problem well in hand, at least in theory. All the manager required was some fertile Pigeon Hawk eggs which he planned to put in the nests of pigeons that lived and roosted on the building. From there on, he figured that nature would take care of things.

Another inquirer, bent on preservation of pigeons rather than their destruction, asked about the practicability of repeated doses of epsom salts for his racing birds. He had read that Army sharpshooters take some just before combat to improve their vision; why wouldn't his birds benefit in like manner? As a matter of fact, such medication is a common practice among racing pigeon fanciers.

Rodents, snakes and all manner of insects harass many home owners. Most people attempt to overcome their problems before making inquiries and many call merely to ask for confirmation of some scheme they have in mind such as, for instance, the plan to feed poisoned blood to bedbugs, a pig to rid a field of snakes or a snake to rid a house of mice. One person making the last-mentioned inquiry laid his plans carefully; he asked from us an estimate of the cost of a snake, how often the snake would feed and how long it would take the snake to eat up its cost price in mice. Also on the cautious side was the woman whose home had been invaded by a snake. A four-page letter told of the distressing situation with maids leaving and the household in general uproar. The letter ended with an urgent appeal for help—but with the following restriction: "If there is any charge for this information, don't send it."



Certainly under the heading of economics comes the problem of a doctor from the Deep South. One of his patients took too literally his statement that he would accept his fees in "anything from kawn likker to rattlesnakes," and the doctor wanted to know the trade-in value of five big Diamond-backs in his possession.

Constantly besieged with multiplication problems of owners of rabbits, rats and mice, we still may sympathize with the rooming house owner whose tenant slipped out owing board but leaving behind four white rats which had made the gracious effort to repay for the hospitality offered them by producing progeny to the number of sixty. That was another matter of trade-in value, in which the rats should have been allowed a little more time to even the score.

Strange requests, too numerous to mention, are made each year. Some may be complied with easily, others with reservations or not at all. We did supply a few feathers from a white pheasant, although we lacked the faith of the recipient that they would help to cure his brother in Italy, suffering from some lingering malady. Nor could we be convinced that stork droppings would have the suggested desired results. An ounce of hippopotamus sweat we did not even attempt to gather, even though the person requesting it gave us the option of providing it dried or in a vinegar solution. Children often write in for pet animals — monkeys, baby bears, baby lions, donkeys or even Giant Pandas. One of the most appealing was from a youngster of six who confided that he had "some dollars" in his bank and would we please send him, at Christmas, a gorilla. But if we did not have a gorilla, then please a zebra, for to pull his wagon. He liked horses.

Under a psychological rather than an economic heading would be the offer of one man to allow himself to be bitten, for a price, by any poisonous snake. His claim to immunity was somewhat offset by his admission that, although bitten several hundred times by many kinds of poisonous snakes, to date he had lost *only* his left arm, three fingers on his right hand and one leg.

The problem of a "bird lover" who professed a keen interest and liking for all birds, but could

not tolerate the cooing of pigeons, was also deposited on our doorstep. Since removal of the pigeons was not feasible, we could only suggest a personal adjustment, either mental or physical.

Prepared for almost any kind of question, we were nevertheless taken by surprise one day with "Do cows have tartar on their teeth?" A call to our Veterinarian confirmed our impression that they are not free of this dental problem but that they are not as subject to it as are carnivorous animals.

Giraffes and elephants are subjects of frequent discussion and dispute. Inquiries about giraffes are generally centered on their necks. Perhaps it is difficult for many people to believe that this very long member contains only the seven neck vertebrae found in most mammals and that the giraffe does not suffer more frequently or violently from sore throat than other animals. Nor is it entirely voiceless. The giraffe has a larynx and can expel air through it, making a low mooring sound, which it is unable to modify. And elephants are not really afraid of mice, although children's books and folk lore would have us believe this. The control of mice has always

been a problem in our Elephant House and the pachyderms seem almost unaware of their presence, though there is little doubt that it would be inadvisable for a mouse to attempt to crawl up an elephant's trunk. Fascination by the legend that elephants in their last

days travel to a common grave, prompts many people to call us for confirmation, or for information about the location of this elephant cemetery. Perhaps there is the lure of cornering the ivory market, should this mythical spot become a reality.

National or local word puzzle contests always produce a flurry of inquiries that sometimes attain avalanche proportions. A two-day check kept during one of these contests recently showed 256 calls and dozens of letters, begging for the name of one pictured mammal. Descriptions were so varied and included so many strange characteristics that we certainly doubted they could all be embodied in one animal. However, eventually the newspaper illustration of this creature was produced and it turned out to be the



Yapock, a tropical American water-opossum. Little wonder the average newspaper reader was unfamiliar with the species which, to our knowledge, has never been exhibited alive in any zoo.

We do not always please and satisfy. Quite recently a woman writer found it necessary to refer to some bird that sings only at night and she was quite certain the answer was the nightingale or the mockingbird. Calling for confirmation, she was angry and indignant when told that both species sing by day as well as night, and hung up expressing her displeasure at having "wasted her time trying to obtain information." All she had wanted was confirmation in error.

Occasionally, but rarely, we must confess to some loss of patience. We sympathize completely, for instance, with a free lance writer who may come or call, thinking it would be nice to do a story about storks. But it would be more considerate of him if he did a little preliminary research first instead of expecting to be supplied completely with all basic information as well as anecdotes to enliven his literary efforts. A few such appeals may be taken care of, but the world does seem remarkably full of free lance writers with sketchy ideas. Teachers, also, sometimes take short-cuts in making class room assignments in natural history. Recently three small boys came into the office for help on their school project, which was "The Evolution of Vertebrates." Questioning revealed that they were not entirely sure what they required but would like information on how birds, mammals and reptiles originated, how they now survive, what they feed on and how they live, and what are their chances for continued success. They were understanding when we explained that the subject could not possibly be contained in a term theme, no matter how briefly treated, and suggested that they ask their teacher to narrow down the assignment. That was on Saturday. On Tuesday they came

One Day's Harvest of Questions

Just in case anyone has any lingering doubts about the variety of questions that flow into the Zoological Park by telephone, here is an actual list of the questions that were asked by telephone in the course of one day in May:

How many Kangaroos are there in the United States now?

How and what do you feed newly-hatched snails?

Where can I get a tame bull for use in a Mock Toreador show that will run all summer?

What is a Kangaroo's pouch lined with?

How often do Lions eat, in a wild state?

Do Ferrets have a keen sense of sight and smell?

Would Squirrels and Rats cross-breed?

Are apes right-handed or left-handed?

When are Peacocks in full feather?

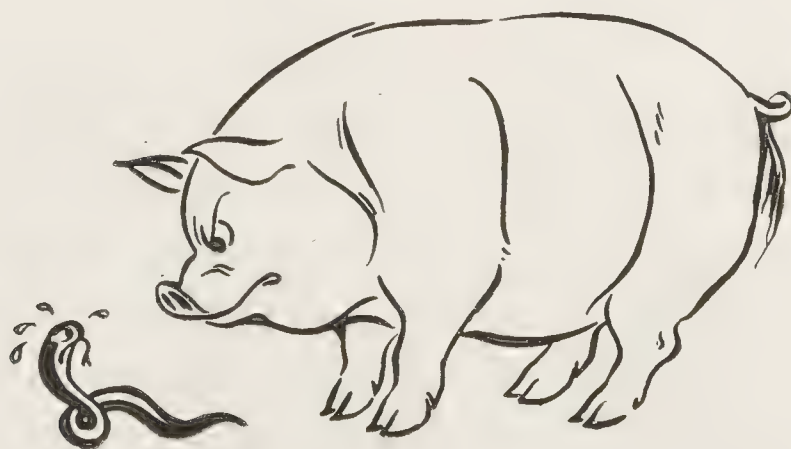
What is the longevity of Kangaroos?

Do Seahorses have any special or symbolic significance?

How can I tell the difference between frog's eggs and toad's eggs?

back, all smiles. One had been assigned reptiles, the other birds and the third mammals!

Probably the pinnacle of information-seeking was reached in a letter from a student interested in monkeys. The questions in his letter were sensible, but so numerous. Surely he had covered the field. But he was taking no chances and finished his letter thus: "And please answer any questions I have left out."



ABOUT BULL SNAKES

By **EARL JACKSON**
National Park Service

AS I WAS DRIVING ALONG a country road in central Arizona one evening I met the largest bull snake I have ever seen—stretched squarely and typically across the road. For an instant my brain misdoubted the testimony of my eyes, for this snake seemed to be measured in yards instead of in feet — and, indeed, it proved to be somewhat more than my own length of six feet four inches, although not up to the recorded maximum of seven feet eight inches.

Now, I have a long-standing aversion to handling large snakes. I also have an aversion to running over them in an automobile, or to killing them in any other way. But I was in a hurry and this fine specimen of *Pituophis sayi affinis* had learned that a hard-packed roadway retains the sun's heat at night much longer than the adjacent loose earth. Since its body is lacking in thermostatic control, it is almost entirely dependent upon its surroundings for its body heat and it was reluctant to give up a warm berth across the road for the sake of a mere flivver.

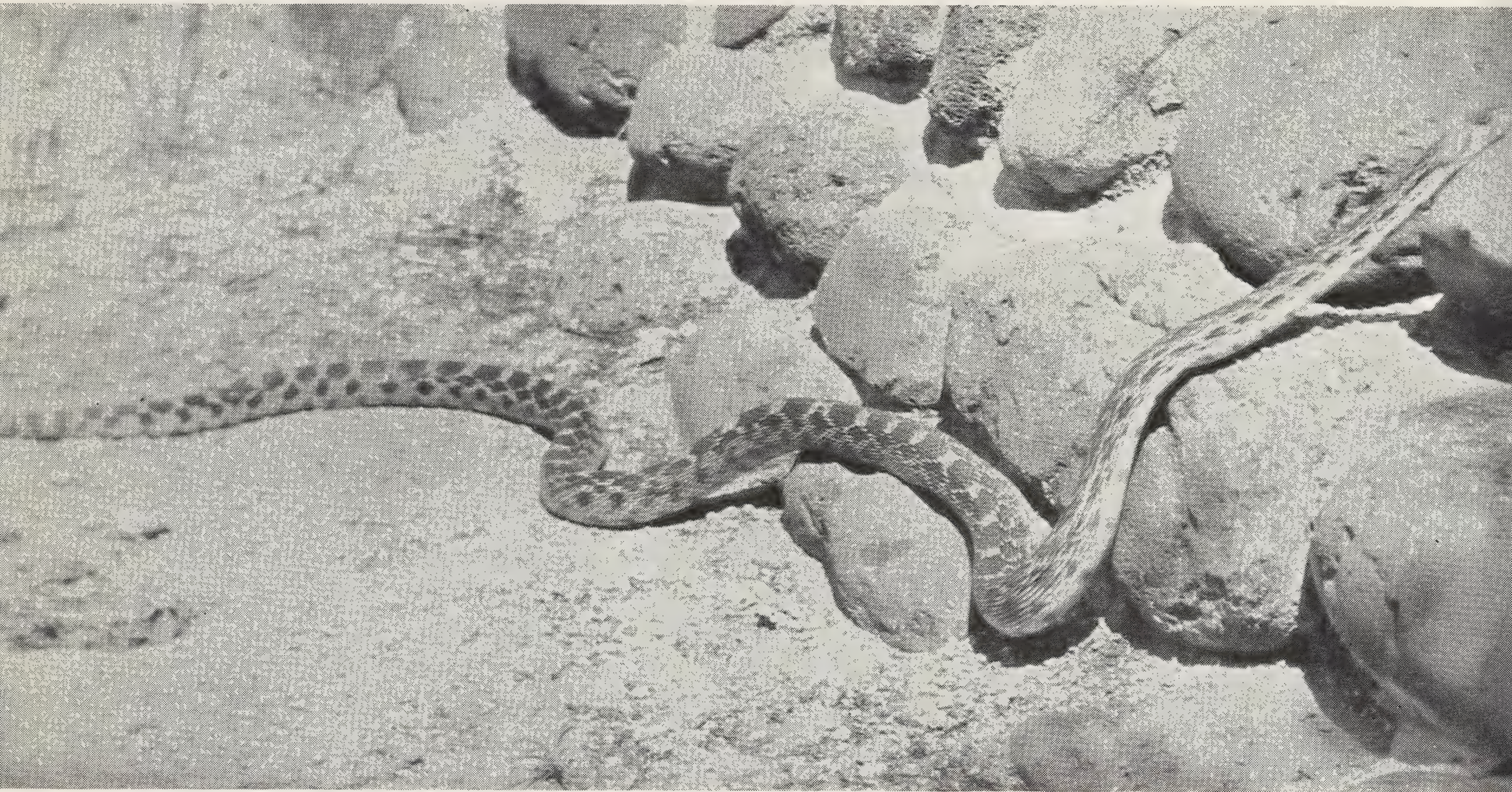
There was nothing to it but to get out of the car and try to shoo the snake away. Very leisurely, it began to glide away — but *very* leisurely. I decided to give it a lift and incidentally to assist it far enough from the road so that it would not be likely to risk its neck crossing it again. I stepped quickly toward it and it reacted instantly, bridling and turning to assume the coiled defensive position, vibrating its tail and rudely sticking out its long tongue.

It seemed a good time for me to overcome my own timidity about big snakes so I waited a moment until it had calmed and had started crawling away. Then, using slow motion, I approached and placed my hand gently on its tail. According to pattern, it jerked its head angrily

back, but not far enough to bite me. The touch disturbed the snake enough so that it decided to retreat in more haste. I again touched its tail, this time getting a gentle grip, and as its efforts to escape became more intense I worked my hands, one after the other, gently and slowly but firmly toward its equator. By this time I was near enough the head to reach out with my free hand and grasp the body snugly just behind the head. After only a moderate amount of struggling the bull snake became quite calm, and I let it coil around my arm. After a few moments of quiet handling I released its head, and found it as tractable as bull snakes are supposed to be.

The significant thing to me about carrying this snake away from the highway was that it was the first time I had been able to overcome my reluctance to handle a large snake — and to the snake it should have been of importance that I probably saved its life from the next truck or automobile that came along that road. For despite its beneficial habits and the fact that it is known to many people, the bull snake often meets death from automobiles. Motorists kill many purely by accident, along with other snakes that cross the road, but often I have seen a driver deliberately swerve his car to run over a bull snake. The reptile can move its head and the forward third of its body out of reach of an automobile wheel so quickly that the eye can scarcely register the motion, but the remainder of its body is not so agile and a speeding car that aims at the middle of the snake can easily do it in.

My next encounter with a bull snake was with a much smaller specimen under rather curious circumstances. It was in late May and my wife and I were walking across a sandy patch of dry



More than two yards of bull snake going peacefully about its business at the Montezuma Castle National Monument. Big as the snake is, it is of philosophic temperament and easily can be tamed—so much so that the snake is often used by “snake charmers” in their exhibitions. *E. Jackson Photo*

creek bed when we came upon a juvenile snake only 13 inches long; probably it would not have had its first birthday until some time in July. At this first meeting we saw only four inches of its body, for the rest of it was under the sand. It must have been wishing the other portion was hidden, too, for it was very securely held between the teeth of a 22-inch California king snake (*Lampropeltis getulus californiae*).

The desperate contortions of the king snake attracted our attention. He (I think “he” was a “he”) was trying to gain traction so that he could pull his prey out of the sand. It was clear what had happened. The king snake had seen the baby bull snake in a little open space between the weeds and had pursued it. The baby beat a quick retreat but was not quite agile enough to keep its tail from being nabbed.

The aggressor, preferring the front end of a victim because of ease in overcoming and swallowing it, was loath to accept the tail, but apparently figured it was better than nothing. He held on, and the little bull snake, unable to drag its heavier enemy after it, went down. Not for nothing had a long line of burrowing an-

cestors given it a hard snout and the instinct to use it. It struggled until its head and one coil of its body were out of sight in the soft sand, then the muscular little frame pulled farther under by slow degrees, until it reached the stage at which we found it.

For fifteen minutes we watched the struggle. An inch was all the antagonists could gain, either way. The king snake was much stronger and heavier, but without even a blade of grass for his frantically groping tail to hang to, he was nearly helpless.

Each time the king snake lashed his body about, seeking traction, the bull snake crawled a little farther under the sand. Finally, in one desperate surge of energy, it pulled its imprisoned tail tip entirely under the surface, the enemy's head still hanging on. For several minutes more nothing was visible but the writhing king snake's body, from the neck back.

If you had your mouth open under the sand, even though it was stuffed with a hot dog, sand would get in and it would be mighty uncomfortable. The king snake finally had to turn loose and bring his head back to the surface. He lay

there for several minutes, the picture of complete exhaustion, restlessly working his jaws as if to get the dry sand out of his mouth, and having very little luck. Wondering how the bull baby was, we dug down about four inches and pulled it out. It seemed in perfect condition, and not distressed by the sand. We released it a short distance away, then carried the king snake to a pool of water in the creek, and gave him a bath which he didn't like at all, but which got the grit out of his teeth.

One investigator was fortunate enough to find a female bull snake in mid-May when she was about to lay her eggs.¹ She traversed about 100 yards of a field planted with squash and cucumber vines, pausing frequently to test the quality of the soil with her snout. She finally selected a spot by the side of a row of plants, where the soil was less loose and sandy and more favorable for the construction of a nest. Excavation began by loosening the soil with her head; she simply pushed it under the surface, throwing out the loose dirt, and brushed away loosened soil with her tail. A tunnel was finally constructed of sufficient length to conceal her entirely. She remained hidden until her eggs were laid, whereupon she closed the entrance and deserted the spot. Upon excavation, 10 eggs were found to occupy an enlargement of the tunnel six to eight inches below the surface, where they were stuck together in a single cluster.

Howard K. Gloyd reported finding burrows of pocket gophers which had been opened from the outside by bull snakes. The excavated earth was piled in concentric ridges. It is small wonder that bull snakes are such a menace to that clan.

Its weakness for rodent meat causes the bull snake lots of trouble, for it is often found with bad scars on its body, caused by the sharp teeth of rodents. Apparently the snake can capture these creatures in their tunnels. When attacking in a narrow space, instead of attempting to coil around the victim the reptile compresses it against one wall until it is crushed into submission, then swallows it head first. Small, weak victims are often swallowed alive. Larger prey, when not in a confined area, is killed by constriction first.

All six species and thirteen forms of bull snake have a similar and rather varied diet. The greater part of their food is small mammals, especially pocket gophers, rats, mice, ground squirrels, young rabbits, occasionally lizards, and even other snakes. One individual was actually reported as dining on a small rattlesnake. Unfortunately, like some humans, they cannot always stay on the path of virtue, and sometimes eat birds and eggs.

Herpetologists realize that bull snakes eat almost the same food as rattlesnakes. They are competitors, in some localities. If, within a given area, a number of one type is killed off, that diminution automatically allows room for the other species to become more numerous on the same food supply. Knowledge of this fact alone should cause many people, who otherwise thoughtlessly destroy all snakes, to save bull snakes.

Our friend *Pituophis* sometimes swallows eggs, but one must not get the idea that a bull snake is an egg epicure, for eggs are only one small part of its diet. Its real value, part of which can be measured in dollars and cents, is shown by such cases as the following:

One specimen five feet long, found dead on a road next to an alfalfa field at harvest time, contained 35 small mice. Grinnell, an eminent naturalist, cited the bull snake for its great value as a destroyer of pocket gophers and squirrels, and the Bronx Zoo's Dr. Ditmars stated that they are highly valuable for their control of several species of very injurious ground squirrels.

Experiments performed by Gloyd and others indicated that the average number of pocket gophers to an acre of alfalfa is about eight. A bull snake five feet long is able to destroy annually all those on an acre and a half, which amounts to a saving to the farmer of \$3.75 a season. Other good observers say the bull snake is a much more effective ratter than most cats, and around the barn pays for itself many times over — unless, as sometimes happens, it gets to eating hen eggs or small chickens. Some California ranchers have enough faith in bull snakes to collect them and turn them loose in gopher burrows on their property.

I have often run across a bull snake crawling or loafing in a big rat nest. Being a thoroughly

¹ "Variations and Relationships in the Snakes of the Genus *Pituophis*," by Olive Griffith Stull.

logical reptile, it sees here an excellent shelter against possible enemies and the sun's heat, and a likely looking hash house. For it loves rats. This taste earns it many aches and pains, for a rat is an effective foe. For that matter, the snake also gets into grave difficulties with the rock squirrel (a bushy-tailed ground squirrel). On May 12, 1941, at about 10 A.M., three men were talking together near the parking area of Montezuma Castle National Monument, in central Arizona. Suddenly their attention was drawn by three squirrels making excited lunges into the tall weeds at the edge of the walkway, at the base of a steep bank. First one squirrel would dart down into the weeds, turn and dash madly up the bank, then another would lunge down and follow suit. The watchers started over to investigate, just as I arrived, and pointed out a five-foot bull snake in the weeds.

He was much the worse for wear and tear. Those four-footed villains had found him in this comparatively unprotected spot and ganged up on him. There were several large, bloody gashes on his body, from two or three of which blood was still oozing. He was so far spent that he offered very little hostility when I picked him up. Another half hour of attack and his career would have been over. I put him safely away in our snake box in the cool basement. Next morning, when he was released in a safer spot, he acted much livelier.

The bull snake moults, of course — all snakes do. I do not know how often this normally occurs. One authority thinks bull snakes have a fairly cyclical period of eating, fasting and moulting, about every 30 days. Another kept *Pituophis* in captivity for four months before it moulted, but of course these conditions were unnatural. It is easy to tell when a snake is about to shed. The coverings of its eyes grow dull and lusterless, and spots may occur in places on the body where the dead skin is pulling loose. Finally, when ready to shed, the snake seeks something rough to rub its head against, to loosen the skin from the lips. This done, it goes into a period of intense activity and violent muscular contraction and expansion, in order to separate the dead skin from the body. The creature seeks a place with a rough surface to catch the cast-off garment. Sometimes the skin comes off

in one piece. The snake secretes a fluid which enables it the more easily to separate the dead skin from living tissue. One man watched a bull snake shed its skin in 35 minutes.

I was disappointed one day to be a few hours too late to witness a shedding. A garden hose was coiled rather loosely in the yard, and in and out and round about through the coils was the complete skin of a bull snake that must have been well over five feet long.

Bull snakes are widely spread in the United States, being found from sea level to several thousand feet elevation. Stull defines the range as Guatemala to Canada, including most of Mexico, and all of the United States west of the Mississippi, and east of the Mississippi in Wisconsin, Illinois, Indiana, Tennessee (?), and all the states of the Atlantic coast from Alabama to southeastern New York. You may find him called bull snake, pine snake or gopher snake; in Mexico he is known as the cencuate, or alicante; and in Lower California as the corallilo.

Despite its concealing pattern, the bull snake is inevitably conspicuous because of its size. Records of specimens seven feet eight inches long have been accepted by authorities as authentic, and longer specimens have probably been seen. Those from Arizona are by no means pygmies, as I realized one day when I saw a bull snake stretched across a doorstep, on its leisurely way around the building. The doorstep was exactly six feet long, and there were inches of snake hanging over at either end! It was not less than six feet six inches long, possibly six feet eight.

Earlier I mentioned having seen motorists deliberately try to run over bull snakes on the road. Ask a driver why he does such a thing and he will be likely to reply, "Heck, I thought it was a rattlesnake."

I have even seen farmer boys kill bull snakes — sometimes confusing them with rattlesnakes, but mostly, I fear, simply because they feel they should kill any snakes on sight. Apparently we human beings have a lot of suppressed murder down deep in our hearts, and it often comes out in the slaughter of snakes and other harmless creatures.

There is some reason for confusing a bull snake with a rattlesnake, because of resemblance

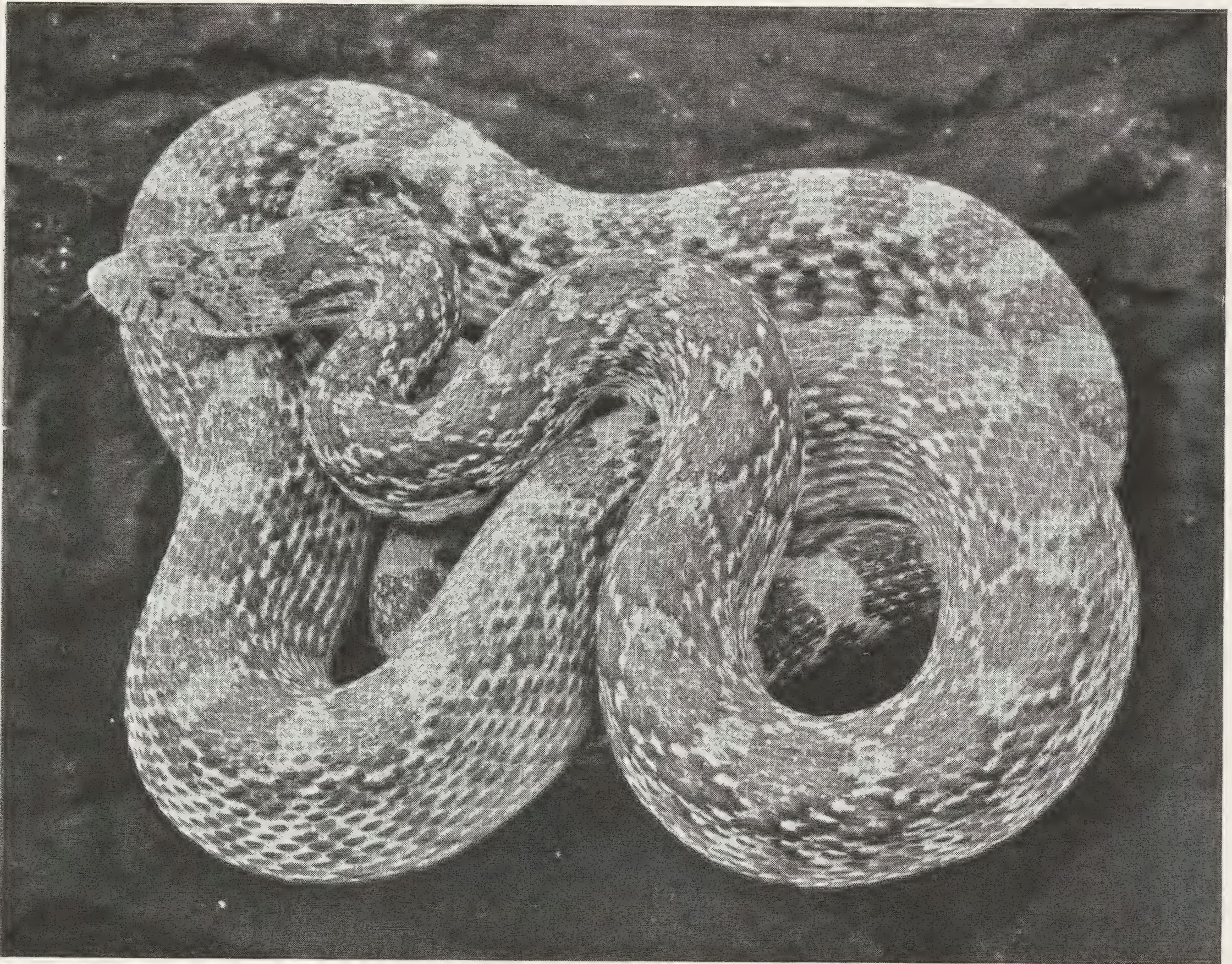


Photo Courtesy National Park Service

Bull snakes which have recently shed often appear lighter in color for a few days. Notice the tiny head, which is in strong contrast to the broad, arrow-shaped head of a rattlesnake. There is really very little excuse for confusing the two reptiles, although Mr. Jackson finds that such confusion does exist.

in color and length, but even at a distance it is easy to see numerous differences. For instance, a bull snake is streamlined from tip to tip; its head is so small and round that it is hard to tell where head leaves off and neck begins. The rattlesnake, on the other hand, has a broad, flattened head on a graceful, slender neck which is out of keeping with its chunky, heavy body. Compare a tap dancer to a heavyweight boxer and you see the difference between the two snakes. Besides, a bull snake has no rattles.

It must be admitted, however, that the bull snake's habits of mimicry cause it a lot of trouble. For it will often vibrate its tail so rapidly, when alarmed or irritated, that if it touches dry leaves or sticks it can easily suggest to a nervous watcher the sound of a rattlesnake. Besides, it has an awe-inspiring habit of hissing very loudly. To many people, any snake that "hisses" must be

deadly poisonous! One writer described the hissing as being very loud and hollow-sounding, like distant thunder! Another observer said it bore a remote resemblance to the bellow of a bull — hence the common name.

The noise is made by the vibration of a small flap on the floor of the mouth immediately in front of the wind pipe. As the snake forcibly expels air from its lungs, this flap splits the blast and produces a sound audible for some little distance. The bull snake's blowing causes some people to call it the "Blow Snake."

In addition to huffing and puffing, our friend will really fight when necessary. He prefers to back up against some object, or to coil his body around a bush or stake. With this barrier to absorb his recoil, a full grown specimen can effectively defend himself by repeated savage blows against the attack of an ordinary dog.

Why Should I Join the Zoological Society?

PLEAS FOR NEW MEMBERS have gone to all those who support the New York Zoological Society, and the officers and staff are gratified by the quick and generous response which many have made. Yet, at a time when people are being requested to give substantial backing to so many worthy causes, the question, "Why should I join the Zoological Society?" may sometimes reasonably arise, and surely needs an answer.

Certainly the horror of recent news impresses all of us with our obligation to foster those relief agencies which deal directly with the vast problem of human misery arising from the war. Yet it must be admitted that to give all of our attention to these vital organizations is equivalent to spending all our means to patch the roof when an entirely new roof is indicated. If the world is to progress, if civilization is ever to be able to look itself in the face again, it is necessary for thoughtful people to take renewed interest in those forces that will teach man to live at better terms with himself. Greater means for man's study of his environment and his adjustment to it are necessary if a permanently peaceful world is ever to be established.

With proper modesty, the New York Zoological Society in its post-war plans is dedicated to just this end: the establishment and maintenance of means by which the general public and the student may increase their knowledge of the world in which they live, and may thereby find a more happy adjustment to it for themselves and for their children. New plans for the extension of animal exhibition by continental habitats, the new Department of Insects and the new Aquarium will round out an exhibition program of greater breadth and interest than has ever been attempted before. The proposed Conservation

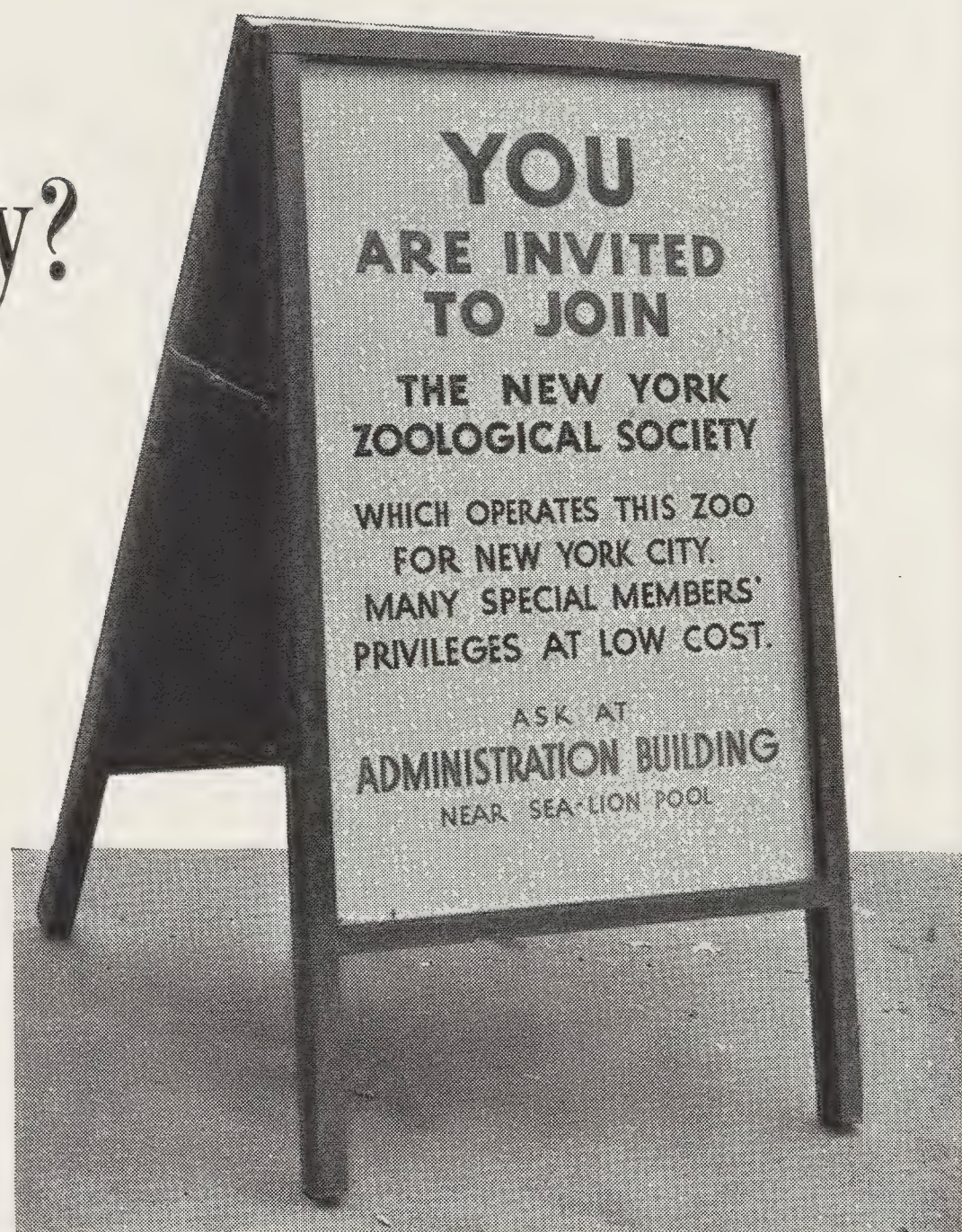


Exhibit will bring the problems of natural resource preservation forcefully to every citizen. Expansion of our resources for scientific research through our Scientific Advisory Council will make the Society an increasing force in the field of comparative medicine. The Society thus intends to equip itself as a complete foundation of zoological exposition and research as soon as possible after the war.

This is an ambitious program and its attainment is dependent upon many more items than blueprints, models and hope. It requires a far greater public support than the Society has ever had before. At its peak in the middle '20's the Society had a membership of some 2,400. In that period after the last war there was a decided upsurge in interest which may naturally be expected to occur again. During the depression years membership declined and for a long period there was no revival of interest. In the last five years this decline has been stemmed, and membership is increasing on a sharply upward line. New members during the first four months of

1945 exceed the total of new members for the previous year.

It is axiomatic that the more members the Society has, the greater can be the privileges conferred and the facilities supplied. The Society has never sought members for profit, and we return nearly the whole of the modest membership fee in the costs of the privileges now extended. With a greater membership, privileges can be increased, and it is our hope that this coming season we will be able to announce new facilities greatly enhancing the value of membership.

A new type of signs and bulletins within the Park will extend the Society's invitation to the public to join us in this campaign for what we hope will be the finest zoological foundation in human history. A list is being compiled of all persons who should have a direct interest in supporting one or another of our important new projects. These persons will be regularly informed of our desire for their membership. Present members and past members will be subjected to a modest but regular plea to give us their endorsement by sending us recruits. We expect to turn every stone in an effort to enlist the active support of all persons who have a basic interest in our future plans.

There are many people who would enjoy membership in the Society, but who do not realize their eligibility. Many people perhaps feel that membership is a matter of invitation or that they must qualify by some educational standard. Many more may not realize the fact that the Society is fundamental to the growth and development of the Park and its remarkable collections, and to the creation of the new Aquarium. Many of these would readily join if the sound aims of the Society were brought to their attention.

"Why should I join the Zoological Society?" is a question which is answered by the fact that only through a large and progressive membership can this fine goal of the Society be reached: the establishment of a zoological foundation that will make an important, continuing contribution to those sciences upon which man's future welfare must in large part rely. The moral support of a much larger and more representative part of our people is essential to our future needs.



Myth No. 1

"Snakes swallow their young in times of danger"

DON'T YOU BELIEVE IT!

Snakes do not protect, feed or shelter their young. The babies scatter and fend for themselves soon after birth. The myth probably started when someone saw a snake eating a smaller snake, or killed a female and found unborn babies in her body cavity.

BUT YOU CAN BELIEVE---

The New York Zoological Society wants you to become a Member. It **NEEDS** your active support. Tremendous and stirring new exhibits are being planned. Ask at the Question House, in the center of the Zoo. **JOIN NOW!**

"Myth" posters like this one, explaining the Society's membership aims, invite the public's eye.

Every member who recruits a new membership speeds the day when the New York Zoological Society will emerge into a new era of greater interest, influence and value for the post-war community. Every new member increases the possibility of our being able to advance the value of membership privileges for those already within our ranks.

Problem of the Invisible Baby Fish

By WILLIAM BRIDGES

So much publicity has been focussed on our Tiger, Lion and Black Leopard cubs that one group of babies has been overlooked — tropical fish that have been hatching in the Aquarium within a few yards of the popular cubs.

Not even the doting staff of the Aquarium could successfully maintain that fish fry are as appealing as tiger cubs, but the reactions evoked in a fish tank when eggs or fry are present *do* have a considerable public interest. The problem, as Curator Christopher Coates comments, is to explain what is going on and to point out the virtually invisible babies to the public.

Mr. Coates' current problem concerns a pair of Ruby Jewelfish (*Hemichromis bimaculatus*), freshwater cichlids from tropical Africa. Most of the time they are extremely unspectacular — olive-brown, dumpy-bodied little creatures about two inches long. They begin to justify their resplendent common name only when their breeding cycle starts, for then the male turns ruby red and the female takes on reddish overtones.

Many generations of the Jewelfish have been bred in the Aquarium and several specimens were on exhibition recently when one pair began to show the telltale coloring. They worked industriously on a square inch of rock in the bottom of their tank, cleaning it off as a repository of their eggs. The Aquarium staff did not see the actual spawning, but there was no doubt about the presence of the eggs, for the breeding pair defended their nest area fiercely and drove the other fish into the farthest corners of the tank.

Only his knowledge of Jewelfish habits told Curator Coates when the eggs had begun to hatch, for the fry are mere pinheads, about a sixteenth of an inch long, and much of the body and tail is transparent. Actually all that can be seen when they first hatch is a minute, animated black dot that represents the eyes of the fry.



The Ruby Jewelfish is an assiduous parent and its eggs—tiny white specks—are always well guarded.

When he saw, however, that the parents were making repeated trips to the egg site, picking something off with their mouths, and hastening to a shallow, spoon-shaped depression in the sand, Coates knew that the babies were hatching and that the parents were depositing them head down in the sand. By steady inspection, squinting along the floor of the sand, he could see a faint shimmering of the water above the sand — the baby tails were wriggling and were just barely visible as a mass effect.

In order to assist the parents and lessen the danger of other Jewelfish breaking through their guard and devouring the babies, Coates dipped out of the tank all the Jewelfish except the parents and their young.

And then for a few hours he was certain he had spoiled everything. The babies had disappeared. Coates figured that in the excitement of the other fish being removed, the parents had devoured their own young — a common, fright-induced reaction.

But the next day all was well — the parents had merely taken the babies into their own mouths for protection, and when the excitement had passed they were carefully re-deposited in the "nursery" in the sand.

For the first few days of their lives, after they have gained enough size to wriggle around the tank by themselves, the babies are carefully herded back to the "nursery" at night by their parents. But they grow rapidly and within a couple of weeks they are large enough to lead their own lives.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

The Garden Party is on June 14: Be Sure to Reserve the Date

The Zoological Park is traditionally—and usually actually—looking its best at the time of the Spring Garden Party. The party this year falls on Thursday, June 14, and a program and invitations will be sent to the entire membership about the time this issue of *ANIMAL KINGDOM* appears.

A number of new exhibits will be opened on Garden Party day—a slight indication of the vigor and activity of the Society even under wartime restrictions. It will be an excellent opportunity for Members to introduce interested friends to the work of the Society.

It's Baby Time Again

Looking back over the years, it seems that baby Zebras are by no means a novelty in the Zoological Park—yet each new one strikes the staff and visitors as the nicest of the whole series. That is particularly the case with little “Andy,” born on May 15, for he is surely one of the strongest and healthiest of all the long line of Zebra colts.

Having had advance intimations that a colt might arrive any day, the keeper of the Zebra House prepared for the event by carpeting the expectant mother's stall with hay. His plans were not in accord with the mother's, however, for during the night she went outside into the hard and stony corral, and there the baby was born. It was very much on its feet, ambling in a stiff-legged fashion after its mother, when the keeper arrived early in the morning.

This is the first Zebra colt born in the Zoo in a little more than two years.

Far rarer is another recent birth—two baby Skunks that arrived on May 16. Skunks, certainly, are not rare in a state of nature, but they are unusual in a zoological park and our last previous record dates back to 1923. Mother and babies are doing well in the Small Mammal

House but are not likely to be seen by visitors for several weeks, until the babies' eyes are open and they start following their mother.

Three Coyotes were born on May 6, two African Palm Civets on April 22 and four Raccoons on April 13. All are in the Small Mammal House.

New Members of the Society

New Members of the New York Zoological Society since the last issue of this magazine are the following:

LIFE

Hiram B. D. Blauvelt	Mrs. James W. Fesler
Mrs. Suydam Cutting	Joseph V. McMullan
Louis W. Maraventano, B.S.M.D.	

ANNUAL

Albert Andriesse	Mrs. Henry J. Mali
William B. Baer	G. W. C. McCarter
Mrs. William Foster Banks	Walter Gordon Merritt
Courtlandt D. Barnes	Mrs. Walter Gordon Merritt
Mrs. Mildred Bello	Lt. Comdr. A. B. Miller, USNR
Gordon William Berger	Sanford Miles
Peter Brandon	Miss Jane Moller
Carl W. Buchheister	Wallace Murray Morse
Lt. D. Homer Buck, USMCR	Mrs. M. L. Neumoegen
Mrs. Walker G. Buckner	Miss Charlotte Niles
Harold R. Caffyn	Jules Pierre, M.D.
Mrs. Joseph M. Cannon	Eugene Henry Primoff
Homer M. Clark	Thomas H. Powers
Henry Parsons Coolidge	Mrs. Thomas H. Powers
J. T. Collidge	Miss Florence Rand
Baroness Alain deRothschild	William Rehwinkel
Mrs. H. Laurence Dowd	Ellis H. Robison
C. Brayton Eddy	Miss Pauline L. Robinson
John Frederics	William A. Rockefeller
Mrs. L. Funke	John Delafield Rudolph
Mrs. Frederick C. Gans	Andre de Saint-Phalle
Frances B. Godwin	Robb Sagendorph
A. M. Gardiner	Mrs. Coster Salm
Miss Joan W. Greene	A. Schneider
Waldo Grose	William D. Scholle
Albert Gubar	Earle T. Shaw, Jr.
Chauncey J. Hamlin	Stanley Simboni
Paul Hammond	Mrs. Walter C. Sinnigen
Mrs. Alfred T. Hess	F. Morton Smith
F. B. Hoffman	Ruth Ferris Smith
Mrs. Lytle Hull	Pfc. Leonard Stoller
Burton N. Johns	Mrs. Edward F. Swift, Jr.
Leo B. Kagan	Miss Caroline E. Veatch
Dr. Barnett Kessler	Dr. J. A. Vuilleumier
Mrs. Homer Laughlin, Jr.	Miss Jane Watson
Richard W. Lawrence	E. Sohler Welch
H. T. Lindeberg	Francis C. Welch
Louis Leu	Mrs. Bertram Wolff
James H. Lowell	Miss Helen M. Woodruff
Jesse J. Ludwig	Mrs. W. L. Wright

The Finest Songster

The Hermit Thrush has the reputation of being North America's finest songster. It is a matter of opinion, of course—some prefer the trill of the Wood Thrush, for example, and hold that the circumstances under which the Hermit Thrush is most frequently heard, at dusk in the deep woods, is a large part of its charm.

A Hermit Thrush is singing daily in the New

England Garden in our Bird House. Masked somewhat by the warblings of a hundred other birds in nearby exhibits, the song nevertheless can be heard plainly by anyone who stands close and concentrates. If one has never heard the Hermit Thrush sing, it is worth making a special trip to the Zoo in the next few weeks. This is one of the best singers we have ever had.

Concepcion Zoo Features Gifts from New York

After considerable negotiations, protracted because of the difficulties of arranging shipments in wartime, the New York Zoological Park sent 13 animals of 8 species to the Zoological Park at Concepcion, Chile, on December 5. We heard promptly from Director Carlos Junge that 11 of the 13 had arrived safely, and that only an Opossum and an Eastern Sparrow Hawk were lost en route.

pears. The shipment (for the information of our Members whose Spanish is rusty) included 1 Gray Fox, 2 Coyotes, 2 Raccoons, 2 Opossums, 2 Skunks, 2 Eastern Sparrow Hawks, 1 Red-tailed Hawk and 1 Snapping Turtle — the latter an enormous, 42-pound specimen caught in Westchester County last summer.

Eventually we will receive a return gift of common Chilean animals from Director Junge. Several years ago a similar exchange produced a Chilean Wild Dog of a subspecies we had never before exhibited.

The Society Assists in Saving Wildlife Refuges in France

Shortly before the end of the war in Europe, Jean Delacour received a cable from Prof. F. Jolliot Curie, director of the National Center for Scientific Research of the French Government, asking for prompt help in staving off the threatened destruction of the great Camargue and Fontainebleau Biological Reserves in France. Prof. Curie reported that the Camargue reserve was scheduled to be used as a practice bombing site, while the forest of Fontainebleau was to be used as an artillery range.

On receipt of this disturbing news, President Osborn acted for the New York Zoological Society and for the American Committee for International Wild Life Protection, and explained the situation to Under Secretary of War Patterson.

His answer was quick and highly satisfactory; he stated that Allied Headquarters in France would undoubtedly do all it could to protect the reserves.

Following this assurance, Mr. Osborn received direct word from the Adjutant General that "Supreme Headquarters of the Allied Expeditionary Forces states that a practice bombing site in the French National Park in the Camargue is being moved. The question of artillery ranges in the forest of Fontainebleau is being investigated and corrective measures will be taken."

The Camargue reserve in southern France is a low, marshy and salty area abounding in bird life. It has a summer population of 10,000 to 15,000 Flamingoes and large colonies of Snowy Egrets, as well as great numbers of waterfowl, rare warblers and the like.

La VOZ del Jardín ZOOLOGICO

N.º 27 - Concepción, Enero de 1945 - Parque Ecuador, frente a Lincoyán

UNA REMESA DE NUEVA YORK

Después de largas negociaciones con el Jardín Zoológico de Nueva York por fin nos fueron enviados en calidad de canje los siguientes ejemplares: 2 coyotes o lobos de las praderas, 2 ositos lavadores, 2 zorrillos o chingues de Norte America, 1 zaragüeyo o comadreja, 1 zorro gris, 1 bonito halcón, otro halcón más, que resultó ser un simple cernícalo, casi idéntico a la especie chilena y 1 tortuga pescadora grande. Queremos dejar constancia de dos hechos: los 11 ejemplares nuevos son carnívoros, sin excepción alguna y con excepción del cernícalo, ninguna de estas especies existe en el Zoológico de Santiago.

LA ATENCION DURANTE EL VIAJE

La remesa anterior vino a bordo del «Lebu» desde Nueva York a Valparaíso. Durante este trayecto fue atendida por la tripulación del barco. En Valparaíso estuvo cerca de dos semanas antes de poder seguir viaje. Ahí los ejemplares estuvieron unos pocos días a cargo del personal de la Aduana y después de un empleado de nuestro Zoológico, don Armando González, quien también los acompañó en el «Mapocho» hasta Penco, cuidando escrupulosamente a la valiosa remesa.

UN CAPATAZ ALTRUISTA

Por ciertos inconvenientes la remesa mencionada no pudo ser retirada inmediatamente de la Aduana de Valparaíso. Durante esos días y muy contrario a ciertas informaciones de algunos diarios los ejemplares fueron atendidos con gran esmero por el Primer Capataz de la 3.ª Sección del Recinto Aduanero, don Leopoldo Zúñiga, quien más tarde se negó a recibir propina alguna en pago de su sacrificio: un caso excepcional y muy laudable en el «Chile interesado y egoísta».

OTRAS NOVEDADES EN EL ZOOLOGICO

En el último tiempo nacieron en el recinto del Zoo 5 cuyes, 5 conejos, 2 gatitos, y 5 catitas de Australia. Se compraron 4 garcetas, 10 palomas mensajeras y 10 peces para acuarios. Obsequios hubieron los siguientes: 1 chuncho por don Ramón Labraña, 2 lagartos pintados, Urostrophus, por los señores Carlos Oliver Sch. y Enrique Romero, 4 culebras chicas, Fatchymenys, por los señores Srs. Orlando Varela, Avelino Alvarado, Manuel Roa y José Miguel Cid, además 1 rana verde por doña Emilia v. de Rodríguez. El Señor Armando Burcio P. le regaló al Zoológico 2 cosas de gran utilidad: 1 regio paiomar y 1 saco de arvejilla, ¡Muchísimas gracias por tanta generosidad!

NO CURIOSIDAD, PERO SI "INTERES"

Aborrecemos a aquellos visitantes que vienen solamente a lo lejos al Zoo, recorriéndolo con prisa, despachándolo en cinco minutos. Esas visitas relámpago dejan siempre una mala impresión en el visitante y en la dirección del plantel. Aquellos vienen por pura curiosidad. En cambio queremos despertar en el público una profunda comprensión por la existencia, un verdadero interés por el progreso y un encariñamiento íntimo en la lucha cultural de nuestro Jardín Zoológico.

Now a copy of the Concepcion Zoo's publication, *La Voz del Jardín Zoológico*, has been received here and it features the announcement of the animals. All of them except one of the hawks was new to the Concepcion Zoo, it ap-



Set up too late for the photograph to be included in Curator Eddy's account of his plans for the new Department of Insects, this is the temporary Black Widow Spider exhibit in the Reptile House. Adult spiders are in the jars on the sides; the center cage contains hundreds of spiderlings.

Mamba, Cobra and Pythons Arrive from Africa

The first shipment of snakes from Africa in more than three years has been placed on exhibition in the Reptile House.

There is a vivid Green Mamba, deadliest of South African snakes, that can streak through the jungle at great speed in quest of mice, rats and birds. Its slim body and narrow head—six feet over-all—are admirably suited for this purpose. When it lies quietly on a tree limb amid green foliage, it can scarcely be seen.

Mambas are especially dangerous because they have needle-like fangs set at the very edge of the upper jaw. The slightest nip drives home the venom.

Also there is a Black Spitting Cobra, the very personification of impending death. Below its hood are red blotches. When disturbed it rears up its head in characteristic cobra fashion, spreads its neck region, looks straight ahead and without warning parts its lips, tosses back its head and ejects a double stream of venom for a distance of ten feet or more. Apparently it strives to hit the eyes of its victims, to blind them for the kill. A special, right-angled channel in the fangs, coupled with the posture of the snake, directs

the poison not only outward but slightly upward.

Finally there are two powerful constrictors that have no poison glands: a young Rock Python and an adult Ball Python. Like most pythons they still possess outward evidence, a pair of horny spurs near the base of the tail, that their prehistoric ancestors were giant lizards with legs. The Ball Python can put on an act all its own. If frightened it will curl into a tight ball, hiding its head, and remain in that position even if tossed high in the air.

Only the Green Mamba has been exhibited at the Zoological Park within the past three years, and the last mamba died in early January, 1943.
—BRAYTON EDDY.

The Death of Limpopo

We are extremely sorry to have to report the death on Monday, May 14, of little Limpopo, one of the two Lion cubs born on December 22. Death was caused by a sudden pneumonia which proved to be secondary to a necrotic lymph gland. Dr. Goss reported that the conditions from which the animal died were of spontaneous origin, unusual and unpredictable, and such matters as sanitation and management were not factors. The little Lion's companions appear to be in excellent health.

The Blue Goose Once More Tries to Nest Here

If the activities of predatory boys can be held in check only a little longer, we may be able to hatch the first Blue Goose in the history of the Zoological Park.

A pair of these birds has been nesting in a clump of iris near the Zebra House and the single egg that remains of a clutch of four should hatch about the time *ANIMAL KINGDOM* goes to press. The other eggs disappeared about 10 days before hatching time, presumably as a result of a raid by boys who had been throwing trash at the nesting bird. Her whole clutch of eggs was stolen last year the night before they were due to hatch. We are taking precautions this year.

The Blue Goose comes from the far north, and it was not until 1929 that anything was known about its nesting habits. In that year a representative of a Canadian Government department found a nest in southwest Baffin Island. The following year another wild nest was discovered in Southampton Island.

Until fairly recent years no one in this country had managed to breed either the Blue Goose or the closely related Snow Goose in captivity, but once the breeding was accomplished, captive-bred birds nested with fair frequency.

The extreme devotion of the gander and its incessant gabbling when anyone comes within sight probably—in the Zoo, at least—do more harm than good, for they serve to advertise the presence of the nest.

Now We Have a Plethora of Black Lambs

When the Children's Zoo opened for the first time, in the spring of 1941, the "Baa-baa Black Sheep" shelter actually housed a black lamb. It was so well received that we vowed we must always have one. Unfortunately, however, for two whole seasons, following the opening year, we were unable to find a successor. Finally someone, afflicted with a touch of genius, suggested Karakuls. What an idea! A coal black, curly-coated Karakul lamb would certainly take care of "Baa-baa Black Sheep." The best way to get one seemed to be the purchase of an expectant mother and this, after long negotiation and a considerable cash outlay, we did.

Now, an adult Karakul Sheep, especially a ewe no longer young, is not a thing of beauty. In fact, it is as ugly as sin. However, we consoled ourselves with visions of a dainty ebony lambling some time in the next spring. Then spring came and went, but brought no lamb. Desperately we searched, and at the last moment dropped on an incredibly beautiful little ram lamb, as black, crinkly and tame as we could have wished. The Children's Zoo christened him "Lambsy Divy," of course—that was 1944—and his friendliness and beauty delighted thousands of children during the summer.

When November came and the Children's Zoo had been closed for the season, we turned



Lambsy Divy, now grown to surprising size, into a field with the old Karakul ewe and three nondescript white ones, all old inhabitants. Later, the flock went to the Farm-in-the-Zoo for the winter. As spring drew near, it became obvious that our hopes were well founded. Early in March, Dr. Goss, under whose watchful eye the Farm flourishes, announced that one of the white ewes had blessed us—and Lambsy Divy—with twin black lambs. After that, they came thick

and fast. The Karakul ewe produced a kinky little ewe lamb, a white ewe came up with a singleton black and finally, the third white ewe found herself nursing another pair of inky twins! It summed up to six black lambs, one of them a pure Karakul. Try as we would, the Children's Zoo could not find room for more than four, so two still grace the Farm-in-the-Zoo. The whole black lamb experiment has, indeed, turned out almost too well — we have a plethora of blacks and would prefer some whites.

The explanation is simple, of course, for the black of the Karakul is genetically dominant to white and all the first cross lambs come black. But someone raised the question of how white sheep can produce occasional black lambs, as they are known to do. After debating this knotty point through several lunch hours, we referred it to Dr. Myron Gordon, the Aquarium geneticist. He ended the argument by explaining that the black of common sheep is recessive instead of dominant and so is bound to pop out now and then. A lucky thing for the Children's Zoo that Lambsy Divy isn't a common sheep!

—LEE S. CRANDALL.

Letter from Dr. Beebe Reports Delights of Rancho Grande

With typical enthusiasm, Dr. William Beebe reports the preliminary activities of the Department of Tropical Research at its new field station at Rancho Grande, Venezuela, in a letter to President Fairfield Osborn.

Later we hope that Dr. Beebe will write a series of articles for *ANIMAL KINGDOM* on the accomplishments of the station, but in the meantime his letter is evidence that things are going well. The letter was written in early April and extracts follow:

"Dear Fair:

"Perhaps the best thing at this stage will be to give you a résumé of the sequence of our days. We are still at the Hotel Jardin and will be for some time as the kitchen and other living arrangements have not yet been completed, although the engineers of the Creole Petroleum Corporation of Venezuela have already performed prodigies. We wake at the reveille of the aviation barracks and field a few hundred yards away. As we dress the sun comes up and the

kiskadees yell their delight at the fact. The little snub-nosed bats settle down under our awnings and the day begins.

"After breakfast the car is waiting, and with our basket of lunch and whatever we brought down the night before, we go through town. Every house or store is a different color, every garden and grilled window individual. The stores are excellent and filled with everything we did not bring down with us. We whizz past the Zoo, with an amazing lot of animals, and unexpectedly well kept considering they have so little money. They will collect for us if we will send down surplus animals.

"Out past small sugarcane and orange groves and then suddenly into the real savanna, somewhat like our Arizona—chaparral, thorny acacias, agaves, with a characteristic and fascinating fauna — crested quail which scurry ahead of us, doves, etc. This is our Zone No. 1 which we have not touched as yet. At the 9th Kilometer stone we begin to curve and rise. The entire road is very wide, of level concrete, perfect for driving, but requiring skill in twisting around hairpin turns. For a long distance the savanna continues, and the first three ranges are high, old volcanic in shape, and barren except for the scanty flora I have mentioned. Up and up we go, leaving the black vultures and taking on turkey vultures soaring high in air.

"We are just beginning to lay the foundation of zonal study, numbering every fiftieth telephone pole in white, recording every significant change with altimeter, and temperature and humidity changes.

"The next range is rather abruptly different, Zone 2A, the deciduous seasonal forest. This is of tall trees, many of which have lost their leaves at this end of the dry season. Here tanagers and wholly new lizards and butterflies are apparent. Then on higher to Zone 2B, the semi-evergreen woods, and next, with a slowly increasing coolness in the air, the montane rain forest or jungle. This shows huge trees, lianas and epiphytes, gorgeous orchids, and is the typical tropical jungle. Finally after crossing half a dozen bridges and curving around breath-taking gorges we come in sight of Rancho Grande, into the final climax cloud jungle, which shows the most amazing mass of flowering trees, immense parasites cling-

ing to the trunks, and such mosses and lichens as only Walt Disney could devise. We wind around the last turn, passing by the building as we would circle an age-old castle, and the factotum Manuel opens the great gates (they should be a portcullis) and we enter our present home. We pass up the steps into the immense verandah, and turn into the finished part (thanks to Creole engineers), and the laboratory, red and white tiled floor, sixty feet long, thirty wide and the same height, with the entire front of glass. (See Jocelyn's illustration in A.K. but now fitted with all necessary tables, shelves, book cases and the 1001 gadgets.)¹

"We look out over the jungle tree-tops except for six giants which rise high overhead, their trunks a mass of strange flowers. Lake Valencia 10 miles away with its islands and the surrounding mountains, some barren, others solid green, makes a sight most difficult to ignore in laboratory work. The day may be clear and sunny until 2 or 3 o'clock when between the two summit passes, out of the right side of our view, begin to pour forth wisps of fleeing cloud mist. This may be driven back but sooner or later it fills the valley, swirls past the windows and we are in the clouds. If we get chilly or wish to continue outdoors work we walk down the road a hundred yards or even around the corner of the valley behind the house and we are in full sunshine again and warmth. Nothing but 'Fantasia' ever had anything like it.

"Our myriad activities will wait for another letter. About 4 P.M. we are ready to start and we reverse our trail back. Fairly fast driving makes this 35 minutes to the hotel, but we usually are in and out of the car for specimens. A bathe, a rest and we have dinner, as well cooked as a New York one. The military band plays in the plaza for an hour, and we work in our rooms until midnight or so.

"Jocelyn chose well, and Rancho Grande is adapted for years of profitable work by us or someone. Please give our affection to all the gang. We wish they could be here to see and feel all the wonderful things which I cannot get into words."

Selah

WILL

¹ Shopping for a Jungle, by Jocelyn Crane. ANIMAL KINGDOM, Vol. 48, No. 1, 1945. Pp. 3-13.

No Baby Hummers

In the last issue of ANIMAL KINGDOM we reported that a Violet-eared Hummingbird from western Costa Rica was building a nest in the Main Bird House. We even expressed a faint hope that we might be the first to breed Hummers in captivity.

The hope has vanished. At least, as far as these Violet-eared Hummers are concerned, for the female died suddenly, and the autopsy showed that she was egg-bound, perhaps the first recorded instance in a Hummingbird of a condition that is unfortunately common in cagebirds.

PUBLICATIONS OF INTEREST

MAMMALS OF THE PACIFIC WORLD. By T. D. Carter, J. E. Hill & G. H. H. Tate. 227 pages, 69 illustrations. The Macmillan Company, New York, 1945. \$3.00.

This is the first of the supplementary volumes on the fauna, flora, peoples and geography of the Pacific designed to follow the general, introductory book, "The Pacific World," published last year under the auspices of the American Committee for International Wild Life Protection and under the editorship of Fairfield Osborn. It represents the collaboration of three specialists in the Department of Mammals of the American Museum of Natural History.

Systematically working through the Orders of mammals found from the Aleutians to Australia, both on continental Asia and among the islands, the book devotes a more or less lengthy paragraph to the general characteristics of each Order and usually to each Family, then discusses individual species at appropriate length—from a page or two to a paragraph. Drawings illustrate representative species of most groups. Although technical terms have usually been avoided, there is a glossary of those that persisted. Of great usefulness not only to men in the Services but to the general student is an Alphabetical Index-Checklist of the Islands, listing the species known to be, or probably, on each island group. An intensely interesting section deals with the reasons why some kinds of mammals are found on one island group and not on another, how they became distributed through the vast Pacific area. There is a necessary plea for conservation of the wild life and, recognizing that Service men are likely to find themselves in areas but poorly known zoologically, some words on the collecting and study of specimens.

90.673
459

ANIMAL KINGDOM



BULLETIN, PUBLISHED BY
NEW YORK ZOOLOGICAL SOCIETY



DAY AT THE FARM-IN-THE-ZOO, *by Leonard J. Goss* • COURTSHIP DISPLAY OF THE
BRELLA BIRD, *by Lee S. Crandall* • INSECT INQUIRIES, *by Brayton Eddy* • NEWS and NOTES

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York 20, N. Y.

PRESIDENT

Fairfield Osborn

FIRST VICE-PRESIDENT

Alfred Ely

SECOND VICE-PRESIDENT

Laurance S. Rockefeller

SECRETARY

Harold J. O'Connell

TREASURER

Cornelius R. Agnew

EXECUTIVE COMMITTEE

Fairfield Osborn, *Chairman*

Cornelius R. Agnew
Alfred Ely
De Forest Grant

Warren Kinney
William De Forest Manice

David H. McAlpin
Robert Moses

Harold J. O'Connell
Laurance S. Rockefeller
J. Watson Webb

BOARD OF TRUSTEES

Class of 1946

George Gordon Battle
George C. Clark
F. Trubee Davison

Jay Downer
Robert I. Gannon

Robert Gordon McKay
Fairfield Osborn

Laurance S. Rockefeller
John M. Schiff
Frederic C. Walcott

Class of 1947

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez

De Forest Grant
Eugene Holman
Warren Kinney

Henry R. Luce
William De Forest Manice
Harold J. O'Connell

Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1948

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely

Marshall Field
Childs Frick
Archer M. Huntington

David H. McAlpin
John H. H. Phipps

Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Ex-officio, The City of New York

The Mayor, Hon. Fiorello H. LaGuardia

Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

John Tee-Van *Executive Secretary*

Jean Delacour *Technical Adviser*

Sam Dunton *Photographer*

William Bridges *Editor & Curator, Publications*

Edward Kearney *Manager, Facilities Dept.*

Sanford Miles *Comptroller*

Quentin Melling Schubert, *Superintendent, Construction and Maintenance*

ZOOLOGICAL PARK

Lee S. Crandall . *General Curator & Curator of Birds*

Leonard J. Goss *Veterinarian*

Brayton Eddy *Curator of Insects & Acting Curator of Reptiles*

Grace Davall *Assistant to General Curator*

W. Reid Blair *Director Emeritus*

William Beebe *Honorary Curator, Birds*

AQUARIUM

Christopher W. Coates *Curator and Aquarist*

C. M. Breder, Jr. . *Research Associate in Ichthyology*

Ross F. Nigrelli *Pathologist*

George M. Smith . *Research Associate in Pathology*

Myron Gordon *Assistant Curator*

Homer W. Smith . *Research Associate in Physiology*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*

Jocelyn Crane *Research Zoologist*

Henry Fleming *Entomologist*

George Swanson *Staff Artist*

Associates

William K. Gregory
John Tee-Van

Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

VOL. XLVIII

AUGUST 3, 1945

No. 4

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York 20, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York 60, N. Y. Title registered with United States Patent Office.

Subscription, \$1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

Question House

The new educational unit known as the Question House, that was opened in the Zoological Park in mid-June, has already proved itself a distinct success. As many as 1,500 people have visited it in a single day. From 50,000 to 100,000 people may be expected to use it in any given year — perhaps even a considerably greater number when its existence becomes more widely known and its reputation as a place where one can get accurate answers to questions concerning animal life becomes more firmly established.

As may be imagined, people come in with all sorts and varieties of questions. A few of them are pretty foolish, to be sure, but the great majority of questions are obviously evoked by a serious interest in zoology. Some of the questions are posers even for the trained staff in attendance. These are investigated either in consultation with the older members of the staff or through the library and are thereupon answered by mail. Requests for good reference books are numerous and as a consequence a group of standard books is now being prepared and these books will be available for sale.

The Question House is an innovation — the first of its kind in any zoological park. Already it is proving itself a success beyond all our hopes. There is really only one concern that we have regarding it, and this has to do with the great curiosity that people have concerning the other living things of this earth. Will the volume of inquiries as time goes on build up to such a degree that it will prove difficult for us to cope with it? We need not really concern ourselves on this score because this is just the kind of problem that our organization would welcome and be prepared to solve.

Fairfield Osborn

IN THIS ISSUE

Ancestor—the Gray Lag Goose	Sam Dunton	COVER
(See Page 116)		
The Farm-in-the-Zoo Appeals to City Folk	Leonard J. Goss	91
A Jungle Pigmy	Paul Griswold Howes	99
Multiple Uxoricide; or, the Two-inch Bluebeard	Christopher W. Coates	103
“Live” Organizations Are the Most Fun	Donald T. Carlisle	104
The Jewel Room		106
The Umbrella Bird Is Not a Dull Fellow Any More	Lee S. Crandall	109
People Are Curious About Insects	Brayton Eddy	113
Behind the Scenes: News and Notes		116

AUG 9 '45



**At milking time the Hired Man brings
the cows in from the clover pasture.**

The FARM-IN-THE-ZOO Appeals to City Folk

By LEONARD J. GOSS

It's a sample of that "little place in the country" so many of them talk about—forgetting that chores start at 3:30 A.M.

THE GIRL REPORTER, visiting the Farm-in-the-Zoo for the first time, was *not* a farmer's daughter. She perched on the "Sitting Fence" beside the pasture and chewed a straw in the best rural style as she interviewed Farmer Nelson Miller, but she gave herself away at last.

"Now, about that herd of lambs," she said, pointing to a dozen Horned Dorset Sheep dozing in the ash grove beyond the pasture, "when a lamb has a baby, what do you call the baby? Isn't there some special name, instead of just 'baby lamb'?"

"Right then I gave up," Farmer Miller told me later. "I was new to this job then, and while I liked the work fine, I kind of wondered to myself why the Bronx Zoo wanted to have a farm. It seemed to me everybody knew about farms and farm animals and they wouldn't be so interested in looking at cows and hogs and sheep and so on, like they would at an elephant, say. But when that city girl talked about a herd of lambs, and what you called a baby lamb, well, I gave up. I guess it's a mighty good thing we've got the Farm-in-the-Zoo."

This summer of 1945 the Farm-in-the-Zoo is four years old and Nelson Miller is in his second year as Farmer. All his doubts about the interest of "city folks" in farms and livestock have long since been resolved, for while some of the visitors to the Farm-in-the-Zoo are just as farmwise as Miller himself, it pleases even them to revisit familiar sights and sounds and smells.

It always irritates Miller when an affectedly fastidious visitor ("Some silly girl, all frilled up





The one time in the day when the old sow and her litter move rapidly and purposefully is feeding time, when the clanking of the milk pails gives warning that the Hired Man or the Farmer is approaching with a few gallons of skim milk, slop and grain. The trough licked clean, they usually go back to sleep.

in lace or something”) holds handkerchief to nose while hurrying through the barn. He likes to recall the exclamation he overheard this summer as a sailor and a girl strolled through and stopped to watch him cleaning a stall.

“Boy!” the sailor said, drawing deep breaths, “I haven’t smelled anything as good as this since I left Ohio!”

In fairness to the Farm’s visitors, it must be said that the ultra nice ones who crinkle their noses at the pungent smells of livestock and pretend to object even to the sweet odors of hay and straw, are comparatively rare among the thousands who stroll through the barn on a summer Sunday afternoon. And in any case, the odors of sweating animals, of manure, of trampled hay,

are usually at a bare minimum for a barn that houses sheep, horses and cows. Miller is a good farmer; he keeps a clean barn.

It seems humorous, now, that before the Farm-in-the-Zoo was opened in the summer of 1942, there was much debate among members of the Zoological Park staff whether it would be advisable to spray the interior of the barn with one of the odor-neutralizing preparations — possibly a pine-scented compound.

The Farmer-in-the-Zoo has been consulted many times by dreamy city dwellers who have always thought that some day . . . a little place in the country . . .

“It’s a funny thing: they see all this livestock, and they see themselves in the middle of it, but



There is always something stirring in the barnyard where the ducks, geese and chickens carry on their multifarious activities. When the Farmer scatters grain, the pigeons come fluttering down from the roof of the barn and visitors gather around to enjoy the cooing and honking, quacking and cackling.

they don't seem to see any hard work," Miller says. He figures he has quashed many a dream by a casual remark that he'd "Better be getting along — been up since three-thirty, and still had a lot of chores to do."

"Since *three-thirty* o'clock?" The accents that float after him are usually shocked.

But it's true. Farmer Miller's day starts when the clock in his bedroom whirrs a muffled alarm — muffled because he hides it under his hat at night, so as not to awaken his wife when he arises to do the morning chores.

The Millers live in the snug five-room apartment on the second floor of the Farm wing adjoining the Poultry Room. At 3:30 A.M. seven days a week Miller is up before the dawn and

after a cup of coffee left over from supper he snaps on the electric lights in the barn and prepares for the morning milking. This summer the Farm has three milkers — a Jersey, a Guernsey and a Milking Shorthorn. They are milked in public by a De Laval mechanical milker at 3:30, 4:00 and 4:30 o'clock each afternoon, and it is good farm practice to milk them as nearly at 12-hour intervals as possible — which means that Miller must clean the stalls and the cows, assemble the mechanical milking apparatus and draw the morning milk by 5 A.M. at the latest.

The early morning chores are a leisurely process and the mid-summer dawn is breaking in gray, watery light when Miller has washed the milking machine and put it away. He carries

pails of grain to the cows and the clanking of tin on concrete arouses the horses and sheep so that they, too, are stirring restlessly and making their low hunger-calls. Ginger, Blondie and Bullet, the Ayrshire and Holstein and Brown Swiss calves, begin bawling for their share of the freshly-drawn milk, and as Miller carries the pails through the barnyard, he is invariably a signal to the Poland China sow and her pigs to make their fastest move of the day — to the feed trough. Their grunts welcome the farmer when he fills their trough with slop, grain and fresh milk. Like a string of popping firecrackers, each move that he makes sets off another series of events; his trip to the hoglot brings out the chickens, ducks and turkeys to be fed and watered.

At this point in the day of the Farmer-in-the-Zoo, it is 6:15 A.M. and the "city farmers" who think they would like a little place in the country are just settling down for the last sweet hour or two of sleep. Farmer Miller knocks off work long enough to return to the apartment for a second cup of coffee — fresh, this time — with Mrs. Miller and for a hasty shave. There is still a lot of work to do before breakfast.

Back in the main barn he sweeps the floors in the public space and in the Poultry Room he dusts the battery chick brooders, the chick hovers and the incubator, mops the floors and fills the feed and water troughs. If he is spry, he has just put the mop away when the Farm bell tolls three times — Mrs. Miller has pulled the rope outside her kitchen window to tell him it is 7:30 o'clock and breakfast is ready.

The Hired Man comes to work at 8 o'clock — by subway. "Farm Helper" is John Gallagher's official title, but call him what you will his lot is not an enviable one on any farm anywhere. The hard work starts when he arrives.

The Farmer and the Hired Man pitch into the thorough cleaning of horse, cow and sheep stalls. They rake and sweep the ten poultry pens and yards at the Red Barn. The yards are pitted with dusting holes where the White-crested Black Polish, the Salmon Faverolles, the Golden Sebrights and the other fancy poultry have been enjoying themselves the day before; dust holes are inevitable and characteristic where chickens are kept, but they are not especially neat and Farmer Miller likes to keep a neat Farm.

Once the Red Barn and its showy breeds of

poultry and pigeons have been tidied up, the Farmer and the Hired Man rake and sweep — yes, *sweep* — the Barnyard while the Rhode Island Reds, the Leghorns, Barred Rocks, Turkeys, Geese and Ducks scatter out of the way. The Farm-in-the-Zoo Barnyard is probably the only barnyard in the world that is swept every day and from a naturalistic farm standpoint it probably would be better if it were left alone from spring to fall. But, then, few real farm barnyards have 150,000 visitors during the summer, with all their attendant littering of paper, straw, leaves, sticks, stones and remnants of lunch.

If all has gone smoothly, Farmer Miller and Hired Man Gallagher are still breathing hard when the Hay Wagon rolls down the Farm Lane from the center of the Zoo a mile away, bringing its first load of anything from twenty to forty children, parents, teachers and schoolchildren. Far down the lane the Farmer can hear them chanting the words on the orange-and-black signposts along the road at intervals of a hundred feet, one line of the verse on each signboard:

"At the Zoo you saw a Gnu—"

"At the Farm you'll see an Ewe."

"If you think we cannot spell,"

"You can just go straight to—"

Here there is a long interval between the signs and the noise rises to a shrill peak of conjecture until the Hay Wagon makes the turn and the "snapper" on the last sign comes into view —

**"The gate attendant—and ask for
A FARM DICTIONARY—2 cents!"**

The advertisement of the Farm Dictionary whets the curiosity of visitors and already 20,000 of the 16-page miniature books have been sold, at 2 cents a copy, and a second edition is in press. It defines such common farm terms as sow, mare, pullet, squab, wether, ram, gee and haw, silo, haymow and so on — being careful to specify pronunciation in moot cases. School groups are among the most eager purchasers of the Farm Dictionary and the discussions and arguments it has settled are numberless. "You do so too milk a cow on the right side — it says so here!"

Incidentally, about 8,000 school children visit the Farm-in-the-Zoo each season; they are admitted free when accompanied by a teacher.

The busiest, if not the hardest, part of the Farmer's day begins when the Farm gates are

opened at 10 A.M. and visitors arrive. Whatever the chores left to be done, he talks and explains and answers questions as he works and he is usually surrounded by a crowd of interested spectators. Being the Farmer-in-the-Zoo is no job for a man who becomes nervous when people watch him work.

By 1 P.M. most of the school groups have opened their lunches in the picnic grove and are temporarily engaged with sandwiches, milk bought at the Farm's milk bar, and review of unfamiliar terms in the Farm Dictionary. Farmer

Miller takes time out for his own lunch in his apartment while the Hired Man drops down, Hired Man fashion, in the shade of a tree in the Calf Lot to enjoy his own sandwich. It might be a summer noon on any farm in America—the Hired Man resting under a tree, the calves nibbling grass lazily, the Suffolk mare and her foal flicking at flies in the shade of the pasture grove and the tinkle of a sheep bell a little way off. Even the rumbling of a subway train on the elevated tracks half a mile away is somnolent, like the rushing of wind through the trees.



Farmer Miller likes his little flock of Horned Dorsets—the sheep that inspired a visitor to ask, “When a lamb has a baby, what do you call the baby?” Both sexes of Horned Dorsets have horns. The breed was developed hundreds of years ago in the British Isles, is used chiefly for the production of meat.



It takes a lot of milk to satisfy a growing calf, and after the final milking at 4:30 P.M. the Hired Man carries three pails, each almost full of skim milk, out to the Calf Lot and the youngsters race toward the fence. Visitors have to hurry if they want to watch; the milk disappears in three minutes.

Afternoon on the Farm-in-the-Zoo has its own pattern. The cows must be brought in from the deep clover pasture. The mare and colt race around the fence. Walks must be swept, eggs gathered, more questions answered, feed and hay thrown down from the barn loft, weeds pulled, grass cut around the walks, windows washed, the goat yard and house cleaned. The little jobs are endless.

Every few days a partial hatch comes off in one side of the electric incubator in the Poultry Room; every three weeks a full hatch comes out of the other side. The hatchings are "staggered," a few duck, chicken or guineafowl eggs at a time, so that there will be a frequent spectacle for the visitors. The opening of the incubator and the removal of the downy chicks is one of the great events at the Farm, and Farmer Miller tries to time each removal of the babies for mid-after-

noon when the largest crowd is present. As a special treat, he allows the youngest visitors to touch a newly hatched chick.

"The way they look while they're reaching out their fingers, you know it's something they'll never forget," he says.

Over the incubator stands a "Hatching Clock," set to correspond with the timing of the full hatch. Each day the hand is moved forward one day, pointing to a cutout figure that shows the state of development of the embryo in the egg.

Elsewhere in the Poultry Room are the earlier products of the incubator — chicks, ducklings and guineafowl all the way from a day or so old to adults. The Farmer's appearance in the Poultry Room to sweep or supply feed and water is always a signal for the questions to start, and he could easily spend a good part of his day there. But there is a lot of other work to be done.

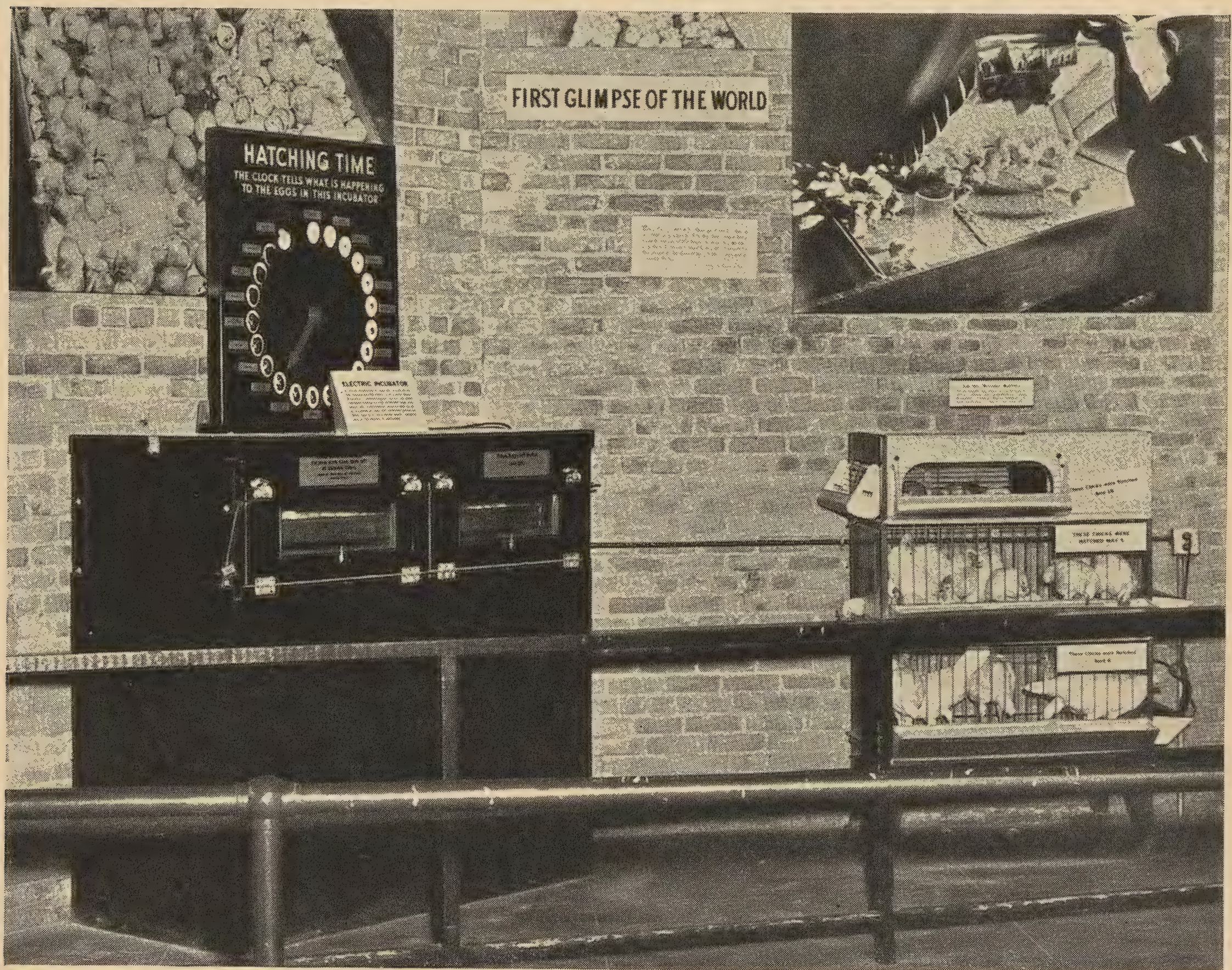
Three P.M. and time to feed the sheep and chickens, brush off the cows, get out the milking equipment and lead out the Guernsey to the milking platform in front of the barn. If these preparations have not already summoned every visitor within sight, the long-drawn-out calls to the livestock over the public address system above the milking platform quickly assemble everyone within hearing. The stock calls are on a phonograph record, especially made for the Farm-in-the-Zoo by an Indiana farmer, and they are the authentic calls that a midwestern farmer would use in calling his pigs, sheep, cows and horses from the fields. There follows a recorded talk on milk production and then the mechanical milking apparatus is started and one after another, at 15-minute intervals, the Guernsey, the Jersey and the Milking Shorthorn are relieved of their day's production. Between milkings, the milk is put through the De Laval separator on the platform

and the crowd watches in fascinated interest while the cream pours from one spout and the skim milk foams out of another.

"What do you do with the milk?" is the inevitable question, and Farmer Miller has to explain that because the Farm-in-the-Zoo has no facilities for pasteurizing the milk, it cannot be used for human consumption and must be given to the calves and to the pigs.

After the afternoon milkings the visitors begin to drift away from the Farm and peace and quietness — of a kind — descend upon barn and pasture and yards. Farmer Miller cleans the stalls and beds down his stock for the night, brings in the calves and horses from the pasture, makes a start on cleaning up the day's debris. Supper is a hearty meal, and leisurely, with only a few small chores to do around the barn before bedtime.

And bedtime is strictly 9 o'clock. Farmer Mil-



The first and most fascinating object in the Poultry Room is the electric incubator and its Hatching Clock that tells, by means of a hand moved every day, what state of development the eggs inside the incubator have reached. All around the walls are brooder batteries and photomurals of egg production.



Beginning at 3:30 o'clock in the afternoon, at half-hourly intervals, the three cows are brought out to the milking platform and the mechanical milker goes to work. After each milking the whole milk is run through the separator in a glass case on the platform, while the crowd hungrily eyes the cream.

ler knows the alarm clock never fails to go off, and it is only forty winks until 3:30 A.M.

* * *

Owners of fine livestock have been most generous in lending outstanding examples of various breeds to the Farm-in-the-Zoo. Commercial companies, too, have been cooperative, the De Laval Separator Company installing the mechanical milker and cream separator that has proved of such great interest, and the Loudon Machinery Company installing the stanchions used in the milking demonstrations.

Owners of livestock to whom we are indebted for the magnificent display this year are:

Warren Kinney, Lee's Hill Farm, New Vernon, N. J. Brown Swiss calf.

Rowe Metcalf, Judd's Bridge Farm, New Milford, Conn. Jersey cow.

Mr. and Mrs. Paul Moore, Hollow Hill Farm, Convent, N. J. Guernsey heifer.

Sheffield Farms Co., Inc., Pompton Plains, N. J. Guernsey cow.

Karchnar Bros., West Hazelton, Penn., and The Milking Shorthorn Society, Chicago, Ill. Milking Shorthorn cow and calf.

L. B. Wescott, Mulhoday Farm, Clinton, N. J. Suffolk mare and colt.

John G. Enck, Maryland, N. Y. Sow and 6 pigs.

A JUNGLE PIGMY

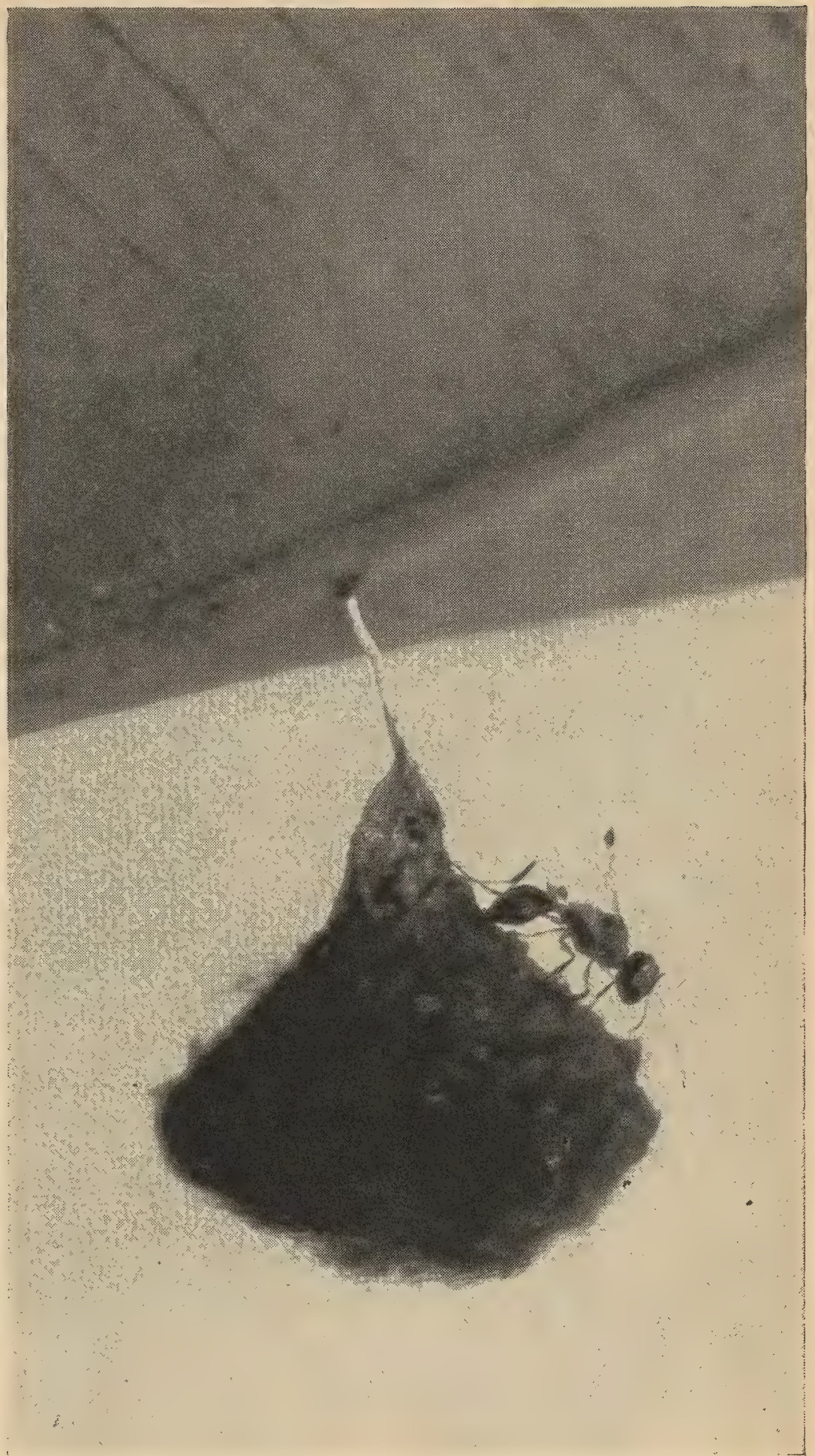
By PAUL GRISWOLD HOWES

*Curator of the Bruce Museum,
Greenwich, Connecticut*

IT WAS A strange turn of fate which one day guided me to a certain tiny nursery of a jungle pigmy. I wonder what strange force piloted me to this enriching reward in such a niche of the great Guiana forest, here to discover the home of so minute a creature? Among the great moras and purplehearts and a dozen others, towering into the tropical heaven of sunlight, trees from which a single seed would dwarf the nest of the tiny insect, it is a wonder that I found her at all.

It is a wasp of which I speak, the most diminutive creature of her kind that I have ever seen, a minute speck of life challenging the jungle and succeeding where far greater creatures fall from day to day, a personality whose nesting habits are as new as was the little insect herself. Science finally named her *Microstigmus guianensis* and here for the first time is her detailed life story.

For my own convenience, when making these studies within the jungle of British Guiana, I named her the Tiny Purse Wasp, which is at once descriptive of her house and self. I marvel at my diminutive friend who might rest in comfort upon the head of a pin! She is bright and colorful with a yellow glistening body, a dotted crown and large green eyes. Her expression—and all wasps are expressive — says plainly, "hurrah for me!" Her independence is indeed exaggerated by her very minuteness, yet she is friendly, to say the least. She comes and goes without paying the slightest attention to my huge bulk beside her nest, even though I occasionally turn up the leaf to which it is attached, and after many such rude interruptions on my part, she still toils unconcernedly within her nursery as it swings to and fro in the gentle forest breeze.

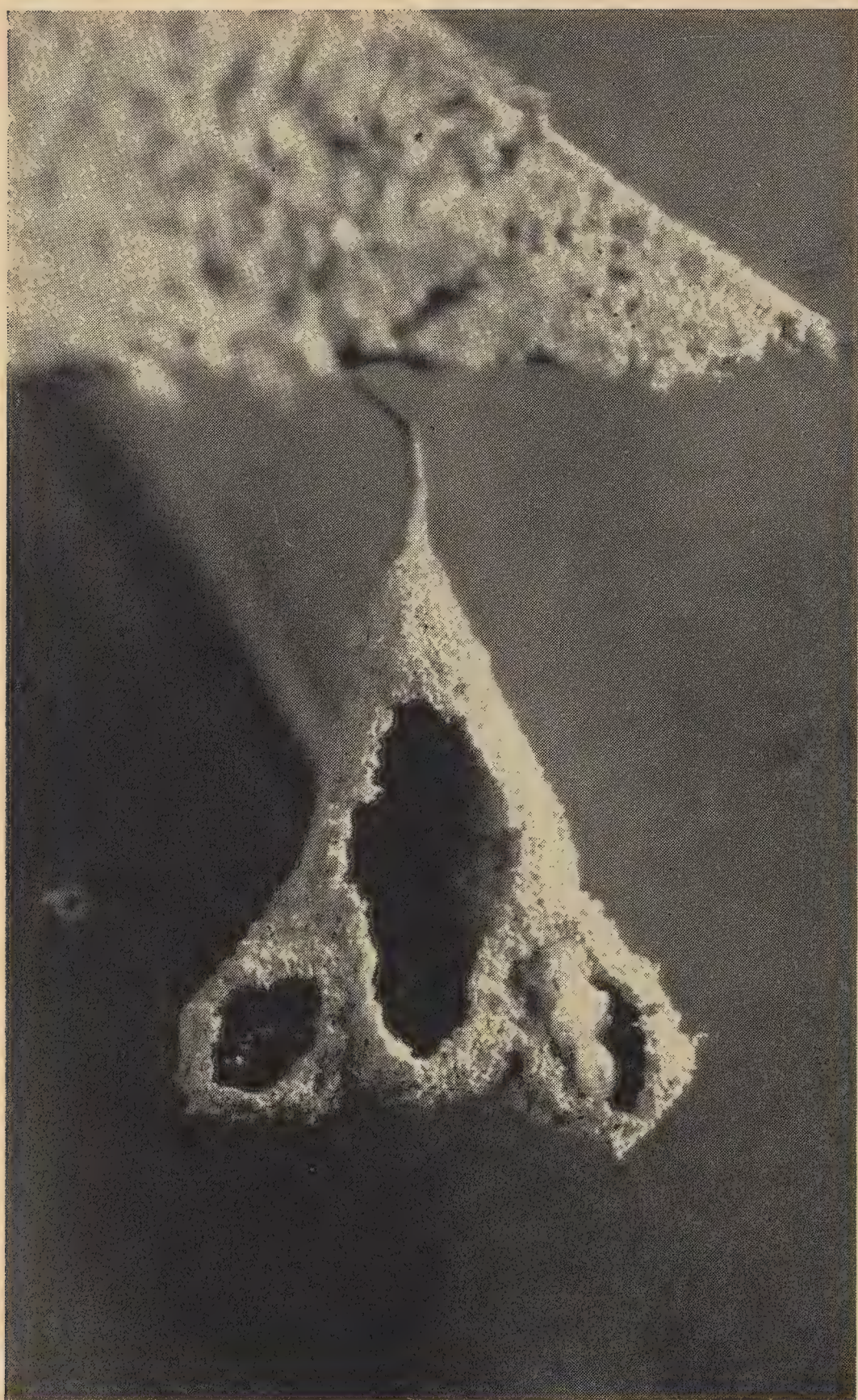


Paul G. Howes Photo

In the chlorophyll-tinted shade of a leaf, this tiny wasp, no bigger than a pin head, builds its gossamer nest and fashions it in the shape of a tiny purse.

In the depths of a jungle paradise I found her, building her purse-like home with golden thread. She had swung it from the underside of a sun-bathed leaf which formed a dome of gorgeous chlorophyll-tinted light above her. Suspended by a long stem of gossamer and bobbing in the slightly stirring air of the forest, it brushed my face as I walked beneath the emerald canopy and thus came the discovery.

After a time as I watched, the mite returned to her nest. She was all but invisible when resting upon it. How could such a minute thing as this know how to weave this nest, as elaborate in its details as the nest of many a



Paul G. Howes Photo

One type of nest, made of green lichen and opened to show collembolids at the left and a pupa of *Microstigmus* at the right. About eight times life size.

bird? I thought with reverence of this tiny living engine so completely at home in her huge surroundings. Above and in the heavy vegetation of the forest lurked a thousand dangers to its larger creatures. Even in my case, a hard-shelled fruit, a huge limb or even a tree might fall at any minute upon my vulnerable head. Again a Bushmaster might lie motionless until I trod upon it, or the hordes of careless Army Ants might suddenly surge my way and drive me off by their vicious advance.

But what of the tiny wasp? She apparently hears not, nor sees the dangers which beset the rest of us. At all times she is undismayed by her surroundings, oblivious to all save the importance of her coming family. She makes her little journeys, procures her thread and other building material from who knows where, sees her brood cells grow through her labors, provides

them with strange food and lays her eggs, living her minute life and days perfectly synchronized into gigantic surroundings.

Far below her swinging home, lies the humid jungle floor, a deep, red-brown- and ocher-patterned blanket of fallen leaves, fruits and twigs, always so wet and deep as to be like a cushion under foot. Below this epidermis of dead but still undecayed vegetation lies the mould world, sheltering an association of tiny living things at once distinct from those in all the rest of the forest.

Upon the fallen leaves and in the moss, about the primitive ferns and fungi, laced in the lower strata of the jungle, dwell myriads of crawling things which bear a strange relation to our wasp. These creatures of which I speak belong to the most remote and primitive order of insects. Their bodies are more or less cylindrical and they range in color through all shades of honey yellow and amber, to brown, lavender and black. Each possesses six legs, a beak-like head, mere rudiments of eyes, but a marvelous catch and spring apparatus which sends the owner about in leaps if need be, each of which lands the jumper twenty or more times its length from the starting point.

Upon these collembolids our tiny wasp preys. Here we have the two extremes of insect life. The wasp, a member of the highest and most specialized order of insects which lives upon the earth today, and the collembolid, the most primitive, a wingless creature probably little changed from its ancestors of remote geological ages. Here are these two orders intimately related in one way, yet at almost exact opposite sides of the canyon, structurally.

Hunting among the leaves and moss, *Microstigmus* collects some fifty of her soft-bodied victims. Possibly she paralyzes them with her sting as do some larger Solitary Wasps, but on this point I am uncertain. At any rate the victims are collected, rolled into a ball at the nest and stored in one of the two or more pockets into which the nursery is divided. Upon the food mass in each cell a tiny egg is deposited, floating upon the mass of collembolid sardines.

In three days the egg hatches and the usual young or larval wasp, a white, footless grub, appears and commences at once to feed upon the accumulated provisions. In a week the

stores have completely vanished into the hungry young insect and a few days later the larva is transformed into a pupa or crysalis. It lies still in its cradle now until color and strength enter its frail body and it is a full two weeks before the perfect little wasp issues from the gossamer-bound birth chamber into the great jungle.

Some of the nests which I found in Guiana are greenish-gray and appear to be produced from tiny lichen shingles. Others are brown or golden yellow or orange, made from gossamer, hairs and who knows what, woven and fastened together with all the skill of Troupial or hang-

bird. Always they float and bob at the ends of tiny threads made of the same material as the nest proper. Some of these supporting threads are more or less straight and of considerable length while others are curled into perfect spiral springs. In every case the nest is an object of fairylike beauty, the result of the tiny insect's great energy and care.

Here in the great South American forest where all events bring forcefully home to one the meaning of survival of the fittest, how does our pigmy succeed?

No larger wild creature appears to be en-

Collembolids or Spring-tails, on fungi. Their size can be compared with that of a white-headed pin at the right. These strange, primitive insects are used as food for young *Microstigmus*.

Paul G. Howes Photo



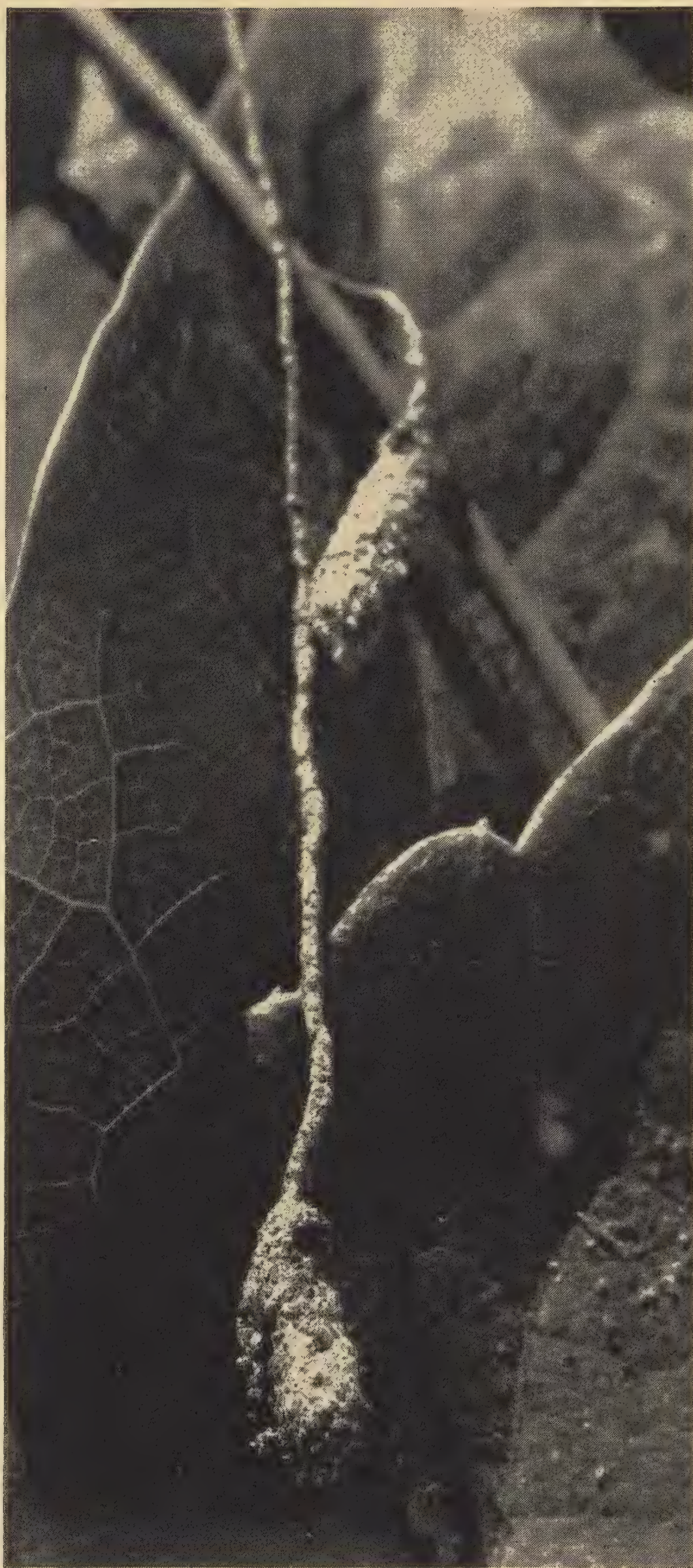
tirely safe in the jungle, and life for them is always uncertain. It hangs in the balance daily for most of the forest denizens and none may foresee what the next minute may unfold. Even the trees and other plant life fight perpetually, ever striving upward to the elixir of sunlight. Living upon the trees are parasites in thousands, plants which wind serpentine coils about their trunks, constricting and often strangling their benefactors who have supplied them with the means of reaching the sunny world of the forest top. Others whose seeds find a footing in damp crevices and hollows among the higher branches thus reach the light and drop their rope-like roots through the air to the forest floor below. On every side one is conscious of the struggle for life which goes endlessly on. Glancing at the gigantic tree trunks of the jungle, each representing a victory dearly won, we think again of this pigmy wasp and how it has succeeded.

The secret may lie in the minuteness of the insect. It fits easily into the niches of most dangers and escapes unharmed. If the insect is hunting upon the forest floor and a limb falls from directly above no harm results, for the natural roughness of the wood or bark offers plenty of cavities into which the minute wasp would fit with plenty of head room to spare. Likewise my great foot would not necessarily crush the pigmy, for there are too many openings in the leaves and debris also into which it would be pressed unhurt.

A falling nut, a mountain compared to *Microstigmus*, would simply brush her aside when in flight because of the air currents set up by its passage. Her all-but-weightless body would escape whereas the same nut might kill or injure me.

Microstigmus is apparently overlooked by enemies which might devour her, also, a fact which is evident when we realize how common are her nests and yet how few progeny she rears in each one of them.

It would appear, then, that some of the tiniest people of the jungle survive through their insignificance. What does a *Microstigmus* wasp care



Paul G. Howes Photo

Still another type of *Microstigmus* nest—suggesting a number of species and a fascinating subject for some student of science to investigate fully.

for a Jaguar, a Fer-de-lance, a malarial mosquito, falling trees or man? Many a human being would shake with fear and soon perish if left alone in a tropical forest unarmed. His size, his consciousness, his imagination and his fear of death would destroy him. Not so our tiny insect!

Multiple Uxoricide; or, the Two-inch Bluebeard

By CHRISTOPHER W. COATES

This is not a mystery story — at least, not the usual mystery — for we know “who done it,” when the deed was done, and how, and to whom. All we don’t know is *why* the two-inches-long Ruby Jewelfish whose touching parental behavior was chronicled in the last issue of *ANIMAL KINGDOM*¹ should have killed three successive mates.

The marital and parental behavior of most of the family Cichlidae, to which the Jewelfish belongs, is usually exemplary and a model for humankind. The fish generally — one might almost say invariably — mate for life and produce brood after brood. It is true that they sometimes lapse into bad temper and when the waters are troubled the wise aquarist will provide some cover into which the vanquished fish can retire for a time.

Either sex may be the aggressor and either sex the winner in these altercations. But as a rule they are not serious or prolonged and if a mass of plants, a few rocks or some other refuge is available for a few minutes, the disturbance is soon forgotten and all is peace.

A number of these fish were spawned and grew up together in one of the reserve tanks of the Aquarium. At maturity they paired off and started to make homes of their own and raise families. The largest of these pairs, after raising two broods together quite amicably and successfully, were selected for exhibition and forthwith picked a site for their future nest, cleaned it scrupulously and deposited a mass of eggs.

With true Jewelfish devotion, both individuals started to tend to the hatching eggs and, when the young were hatched, both parents herded them about, the one foraging around for wanderers from the brood, the other remaining with the closely-knit group. These duties are interchangeable and are usually only onerous when

other fishes are living in the same tank, in which case the outrider fish has not only to collect wandering sons and daughters but to keep the other fishes, regardless of size, at a safe distance from the main body of young. At feeding time each parent will dart off alone, take a mouthful of food and return immediately to relieve the home guard, which then darts away for its mouthful of food and returns to the brood to relieve its mate in turn. This business of sprinting for food, maintaining a constant survey over the disposition of the opposing forces, and taking quick nips at any which look as if they had designs on the babies, is continuous and constantly changing as each parent takes its mouthful of food. When all food is eaten, they return, without discrimination, to their respective duties.

In the case of our Bluebeard, however, after two or three days of domesticity under the constant surveillance of numerous visitors to the Aquarium, the male tired of it all and forthwith killed his mate. At the same time, he continued to guard her — and his — young with exacting care.

When the babies were old enough to leave the father, he was removed and given the run of a large tank in which there were a number of males and females. He immediately selected a second mate and spawned with her without mishap. His behavior was so “correct” that we put the pair on exhibition once more — whereupon they spawned again, still with the usual selectivity of site and enormous care of the young. Within a few days of the hatching, however, Bluebeard killed his new wife, and went right on attending scrupulously to the young.

Once more we gave him a choice of females, once more we put the pair on display. Once more they spawned, and the pattern was repeated:

¹ Problem of the Invisible Baby Fish. By William Bridges. *Animal Kingdom*, May-June, 1945, page 82.

spawning, assiduous care for a few days, and then the seemingly inevitable uxoricide.

In despair we removed the male from exhibition and provided a fresh mate. Two broods have been produced by the pair since then — both in the seclusion of the reserve tanks behind the exhibition panels of the Aquarium.

So far, both parents are enjoying all the blessings of a comfortable home, amicable relations with each other, and the worry and pleasures of raising a large family.

What is the solution of the mystery? Why the

Jekyll-Hyde behavior? There is a reason, of course; there is a good and sufficient reason for everything that fishes do. But whatever it is, it must be determined by a thin, fine and to our senses impalpable difference of habitat. For the reserve tank in which uxoricide does *not* occur is identical in shape and size with the exhibition tank in which it *does*; the food is the same, heating and lighting similar. All conditions except exposure to public view are apparently uniform. Our two-inch Bluebeard, paradoxically, must be shy.

“Live” Organizations Are the Most Fun

By DONALD T. CARLISLE

Chairman, Membership Committee

WE ALL LIKE to belong to clubs, societies, associations that are progressing—with constructive, creative things taking place regularly and with undiminished enthusiasm for future accomplishments. All of us are asked today to support so many causes that have perforce a depressing undertone. It is, then, refreshing and enspiriting to find *one* organization that is not only alive to the present and the future but that has solely creative aims.

The New York Zoological Society is not patching up the results of any of our past mistakes. It is seeking primarily for knowledge that will make the world a better place in which to live.

This Society is “live” in two senses. First, we are progressing steadily toward a great goal even in the face of the restrictions of war. Secondly, in this work we deal with “live” things — mammals, birds, reptiles, fishes and insects — striving constantly not only to exhibit them under more and more natural and pleasing conditions, but also to learn more and more about them and their relationships to us and to each other. Also we are constantly working to protect them.

Take for example our proposed Conservation Unit which we hope to open shortly after the war. Where else than in a great zoological park

can the lessons of conservation be taught so well as here with living models and “from the ground up”? Not only is this the best possible way of demonstrating conservation values, but here we do it in beautiful surroundings yet within the heart of our country’s greatest population center. It should prove to be a model for similar demonstrations in every state in the Union.

The public response to our announcement of the new Department of Insects, described elsewhere in this issue, again shows the great latent public interest in the life about us and its bearing on our own problems.

The life of the Society goes on because it is based on Life itself — a constant, welling spring of experience for those who choose to drink from it.

It is gratifying that in our present effort to increase Society membership we are gaining many entirely new Members, and Members from the younger groups, but it is especially pleasing to us that many former Members who left us perhaps during the depression years are returning to the Society — presumably because our aims are so great, our new ways of doing things so fascinating.

We are grateful for the help of so many Members who have brought us new ones. But we still need the moral support of many more people who will understand and sympathize with our objectives for the years just ahead.

Our program for new memberships will continue throughout this year, and every new Member is a definite step towards making the Society the greatest zoological center yet known to man.

If you cannot solicit members yourself, please send us the names of your good prospects. They will enjoy so much an association with a "live" organization — "live" in two ways.

These are the new Members of the New York Zoological Society since the last issue of ANIMAL KINGDOM—rather, the new Members reported before the forms of the magazine were closed ten days ago. By the time this issue is published the list will certainly be considerably longer.

Life

Lister Carlisle
P. H. B. Frelinghuysen
Gilbert C. Greenway 4th
Robert C. Hill
Arthur Roeder
Mrs. J. Watson Webb

Annual

William J. P. Aberg
E. G. Ackerman
George T. Adee
Alfred Reginald Allen
Lt. (jg) Wm. H. Amos, U.S.N.R.
David Asch
Rogers H. Bacon
C. Philip Barber
Floyd Barbour
Charles E. Bates
Mrs. Thomas T. Bear
Stanley D. Beard
Mrs. F. Wilder Bellamy
Russell Bengel
William Craig Berkson
D. H. Bierman
Dr. Alexander W. Blain
Lt. Anthony A. Bliss
Percy Thayer Blogg
James M. Boyles
Norman Brock
H. Clifford Brown
Dr. M. Vertner Brown
Robert E. Brown
Miss Andrea Bulson
Mrs. J. Randolph Burke
Miss Annie E. F. Bye
John B. Cabot
Mrs. C. A. Castleberry
Dr. McKen Cattell
Stephan Chalner
Miss Cornelia Van A. Chapin
Paul H. Cheney
Saul C. Cohen
Richard Compton
Mrs. Richard Compton
Mrs. R. Constantian
H. J. Cook
Jarvis Cromwell
Mrs. Thayer Cumings
John W. Cutler
Anker N. D. Dalsgaard
Mrs. T. Clarence Davies
Joseph S. Derylo
Alvin Devereux

Alan Devoe
Frederick A. Dewey
Washington Dodge
Mrs. John W. Donaldson
Mrs. Tuckerman Draper
Mrs. Karl Eilers
Miss Catherine Elias
Major Temple Hornaday Fielding
Mrs. Dora Whitman Fluekiger
Leon S. Freeman
Mrs. Jefferson E. Fuller
R. L. Gabriel
Richard V. N. Gambrill
Gordon P. Gaver
Douglas Gibbons
Mrs. Frances E. Graham
Henry G. Gray
Mrs. L. M. Greer
Peter Grimm
H. P. Haldt
William Walker Hanna
Harold Hope Harding, Jr.
George T. Harrison
Dr. Caryl P. Haskins
Carr Heaney
Charles E. Heydt
Robert Hillyer
Philip Hoffeld
Mrs. James W. Holler, Jr.
Mrs. Frank Canfield Hollister
Thomas H. Howard
Mrs. Brooks Howe
Alfred O. Hoyt
George C. Hurdman
Mrs. O'Donnell Iselin
Mrs. Lily B. Javits
Mrs. J. E. Jeffery
Lawrence K. Jennings
Lane Jonap
Louis Paul Jonas
Miss Mary Jean Kempner
Laurence S. Kennedy
E. C. Ketcham
William G. King
Augustus S. Knight, M.D.
Mrs. John Knight
George C. Koch
Richard G. Kruger
Harry La Montagne
Charles C. Lawrence
Miss Gypsy Rose Lee
Mrs. Barent Lefferts
Bert Lytell
Mrs. Bertha Mack
Mrs. Clarence H. Mackay
Marilyn D. Marple
Charles C. Marshall

Mrs. Shelton E. Martin
Lt. Col. George C. Masters
Milton Matter
Mrs. Thomas McCance
Mrs. W. M. McKenzie
Richard Wakefield Miles
W. F. Morgan
Lawrence Morris
Edward A. Munger
Mrs. Margaret Neil
New York Color Slide Club
Douglas C. Orbison
Henry Paeper
Fredrick H. Parker
Mrs. H. H. S. Phillips, Jr.
Auguste R. Pottier
Dr. F. W. Proewig
Mrs. Chester T. Reed
W. R. Reid
Stanley Resor
Grantland Rice
Mrs. Francis Rogers
Rev. Andrew Rogosh
Dr. Leslie A. Sandholzer
Mrs. R. W. Sayles
John Edward Schramm
Kerstin T. Schurman
Sec'y San Antonio Zoological Society
Mrs. R. W. Sexton
Jerry Shrewsbury
Miss Marion G. Sierman
John N. Staples
H. Lyman Stebbins
Roderick Stephens
Mrs. John A. Stevens
Thomas Sullivan
C. G. Symington
Miss Melita Taddiken
Howard L. Taylor
Thelma Teasdale
Hermann A. Thoenen
Rodman K. Tilt, Jr.
Mrs. Richard Trumble, Jr.
Miss Alma Trimmer
George W. Tucker
Richard George Van Gelder
Richard N. Vieth
Miss Edwyna Von Gal
Henry F. Wanger
J. Spencer Weed
Leonard D. Weil
Mrs. Caroline V. der W. Wiese
Ben Willis
Tate Woody
Will H. Yolen



The JEWEL ROOM

Our jewels are tropical birds — the snippets of living light that actually glitter and glow with the fires of ruby and topaz, opal and aquamarine, sapphire and lapis lazuli until there is scarcely a precious stone that cannot be matched by some glinting color in these living jewels.

At last they have a setting, in the Bird House of the Zoological Park, that is worthy of their superlative beauty. Twenty brightly lighted compartments circle the darkened room in the southeast wing of the

From the dark interior of the Jewel Room, visitors gaze into the brilliantly lighted and glass-fronted compartments where bright tropical birds flit among jungle foliage and flowers that often match the colors of the birds themselves.

building; visitors stand in the darkness and watch the flashing wings, the glittering throats, the glowing bodies of the birds among the tropical foliage.

No small part of the beauty of the setting is lent by the artistry of Jean Delacour, who designed the rockwork and planting of the individual compartments.



▲ Rothschild's Myna is a slim and mostly snow-white bird that often displays in its leafy home.

In a green corner of jungle foliage, the Eastern Cock-of-the-Rock flaunts his beauty ▼





▲ The Yellow-fronted Green Tanager (left) is a foil for a tiny, lovely Blue-throated Calliste.

Many kinds of small and bright seed-eating birds inhabit the big compartment at the end ▼



The Umbrella Bird Is Not a Dull Fellow Any More

By LEE S. CRANDALL

WHEN CHARLES CORDIER arrived from Costa Rica on October 9, 1942, bringing with him, among other great rarities, three Bare-necked Umbrella Birds (*Cephalopterus ornatus glabri-collis*), it seemed to us that the mere possession of such fabulous creatures was satisfaction enough. True, they were not beautiful—some realists have even gone so far as to name them “ugly”—and like all Cotingas, they were definitely dull. But in spite of all, they really were Umbrella Birds and if we could solve the problem of their long term requirements, they must reveal to us much that had been unknown. For only once before, as far as we can learn, has an Umbrella Bird been kept in captivity in either Europe or North America. According to a note by Frank Finn in *Avicultural Magazine* for October, 1909, this was a young bird owned in England by Mr. H. C. Molineaux, a private aviculturist. Nothing beyond the arrival of the bird is recorded.

With nothing whatever to guide us, beyond Cordier's brief experience, we put the adult male and the female together in one cage and an immature male in another. The cages seemed large enough and both were planted with small palms for shelter. For a year, nothing in particular happened. All of the birds remained dull and quiet, and although we pointed them out frequently on personally-conducted tours, it was difficult to convince visitors that Umbrella Birds are something of special interest. Then we noticed that the young male was fading and in spite of all we could do, he became rapidly weaker until his death. A post mortem by Doctor Goss showed a necrotic mass of undeterminable nature in the

We felt apologetic about this unexciting rarity—until conditions were just right and he began his extraordinary display.

thorax. This was better, at least, than malnutrition, and we were stimulated to greater efforts with the remaining pair.

When the big planted cage in the south hall of the Bird House, known as the Tropical Rain Forest, was reconditioned in the autumn of 1944, we looked about for birds to people it. First of all, of course, we would try again with the Umbrella Birds. It just might suit them.

From the very first, the experiment was a success. The birds agreed perfectly, with no quarreling or interference. The Umbrella Birds liked it—we could see that from the beginning. And it was high time they found something they liked, for they were deep in moult and needed to settle down if they were to feather properly. They finished their change of plumage rapidly and soon began to look like real Umbrella Birds. Their black feathers were smooth and shining, their great dark eyes were bright. The “umbrella” of the male was rounded and full, and while sometimes it stood up stiff and straight in front like a well-cut pompadour, it often fell forward, so completely relaxed that it fully covered the great crow-like bill.

Winter passed, and with the first days of spring there were rumors that the Umbrella Bird was playing antics of a sort. I thought at once of Cordier's piece in *ANIMAL KINGDOM* for January-February, 1943—certainly one of the very best we have ever printed. He called it “The Um-



When the male Umbrella Bird (at right) is out of breeding condition, the bare, red throat area is greatly contracted and gives little promise of the enormous proportions it will bear later when inflated. This is the pair of Umbrella Birds, shortly after arrival and before they had really settled down.



The contrast with the photograph at the top of this page is apparent in this picture, made this spring when the Umbrella Bird was at the height of its display. Even the tiny, feather-tipped "pig tail" at the bottom of the throat area can be seen. The far less spectacular female Umbrella Bird is at the left.



At the peak of display. Here the male Umbrella Bird has inflated his air sac fully until it is "as large as a tomato," as Charles Cordier described it after seeing the display in the forests of Costa Rica. Even distended in this way, the bare skin remains bright red. The fleshy tassel near the lower part of the sac has grown from a three-quarter-inch spike of skin to a length of almost three inches, and when the bird moves his head from side to side rapidly, the tassel will gyrate like the pendulum of a runaway clock.

brella Bird Comes to the Zoo" and in it he reported, among other observations, concerning the courtship display of this little known species. I hunted out the piece and checked it with care. With some idea of what to expect, I began spending noon hours in front of the Tropical Rain Forest. And I had not long to wait. On March 30, 1945, to be exact, I witnessed the full spectacle. On subsequent numerous occasions, I was able to add a few minor details.

Since mid-winter, the bare skin on the throat of the male had been expanding and deepening the intensity of its scarlet. At the beginning of the display, this brilliant patch spread slightly, laterally, so that there was a sharp contrast against the deep black of head and neck. It was also extended downward, with a distension as large as a pigeon egg at the very bottom.

There are two distinct display forms. In the first, the bird turns his head forward and down, gasps, and distends his air sack to the size and shape of a scarlet goose egg, big end down. The fleshy tassel, tipped with scraggly feathers and ordinarily about three-quarters of an inch in length, is seen to have lengthened to quite three inches, although its diameter is hardly greater. Then the head is moved rapidly from side to side, making the tassel gyrate wildly, like a pendulum out of time with its clock. During this performance, the bird utters a soft "br-r-r-r," which I think Cordier refers to when he says it sounds like a distant jaguar. I suppose, in the forest, it might.

In the second form of display, the force of the expansion is forward rather than downward. There is the same pigeon's egg at the bottom to begin with, but this time the bird stands upright, his crest doing a tight pompadour. Suddenly, he snaps his head forward, dropping the spread umbrella so that the bill is entirely covered. He then jerks upright again and extends his air sac until he looks like a brilliant toy balloon and nearly as perfectly spherical. Now he throws his head sharply backward, making the tassel fly violently in and out, in the axis of his body. At the same time, he gives forth a loud "plunk"—which Cordier calls a "boom." After several of these violent convulsions, the air is expelled, with no sound.

It is pleasant to have so full a confirmation of what Cordier saw in the jungles of Costa Rica. And it is pleasant to know that the Umbrella Bird is far from being the dull creature we had thought him.



The three photographs on this page are extracts from a motion picture of the display of the Umbrella Bird, made by Staff Photographer Sam Duntton. Here the male begins to inflate his air sac.



A stage in upright display form, in which the lower end of the sac looks like "a scarlet goose egg."

A still later part of this same form of display. Note the long, thin, dependent tassel below the air sac.



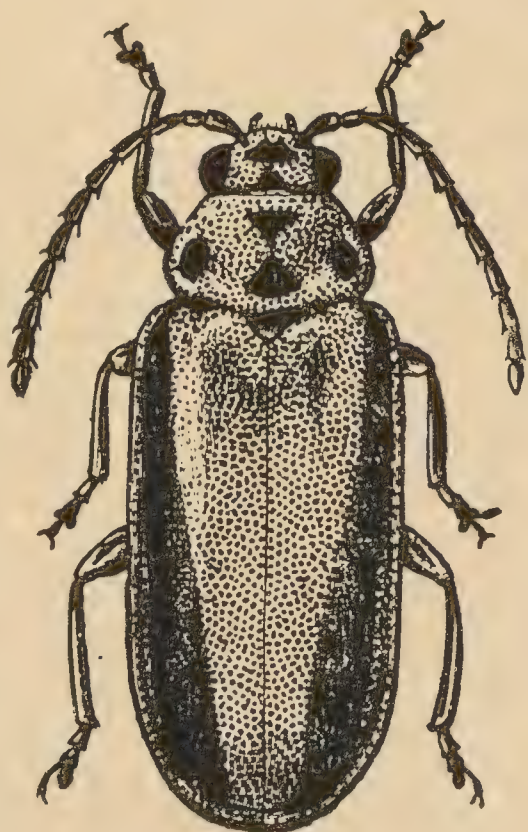
PEOPLE Are Curious About INSECTS

By BRAYTON EDDY

THE SUREST WAY to become quickly and widely known is to offer a service that meets a public need, that solves a current problem while it is still in sharp focus. If there is any doubt about this statement, it can be verified by consulting the mailman and the telephone operator at the New York Zoological Park.

Scarcely a month has elapsed since the Department of Insects was established at the Administration Building, yet already one of its avowed functions is known in at least six states. No sooner did the press and radio announce that the Department would identify insects and furnish information on their control than the public sprang into action. The response was immediate and almost overwhelming. Dead insects arrived in pill boxes, small bottles, vials and typewriter ribbon tins. Most of the inquiries are answered by telephone or letter; but where a control problem is particularly involved, an office interview is encouraged.

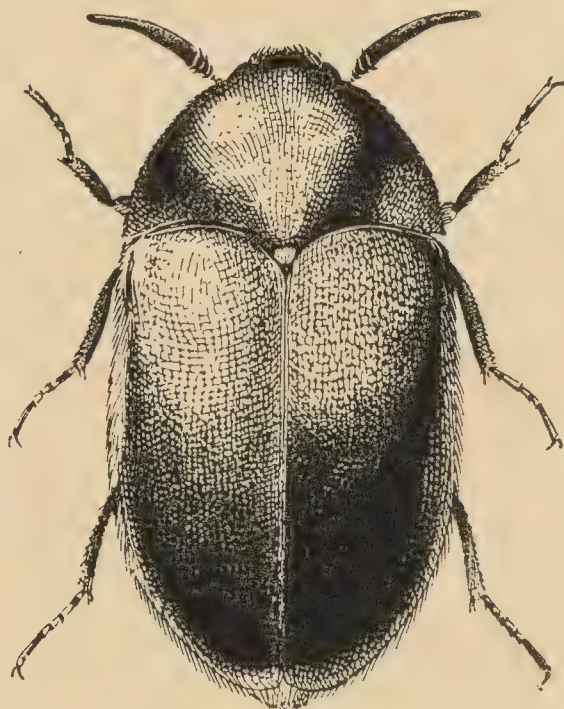
The chief cause of public concern to date has been mistaken identity. It is assumed that an insect will accomplish the worst even though it sails under neutral or even friendly colors. The Elm Leaf Beetle¹ is a point in question. Several specimens have been received from eastern Pennsylvania with the notation that they were found in the house but that no exterminator had been able to decide what they were or how to get rid of them.



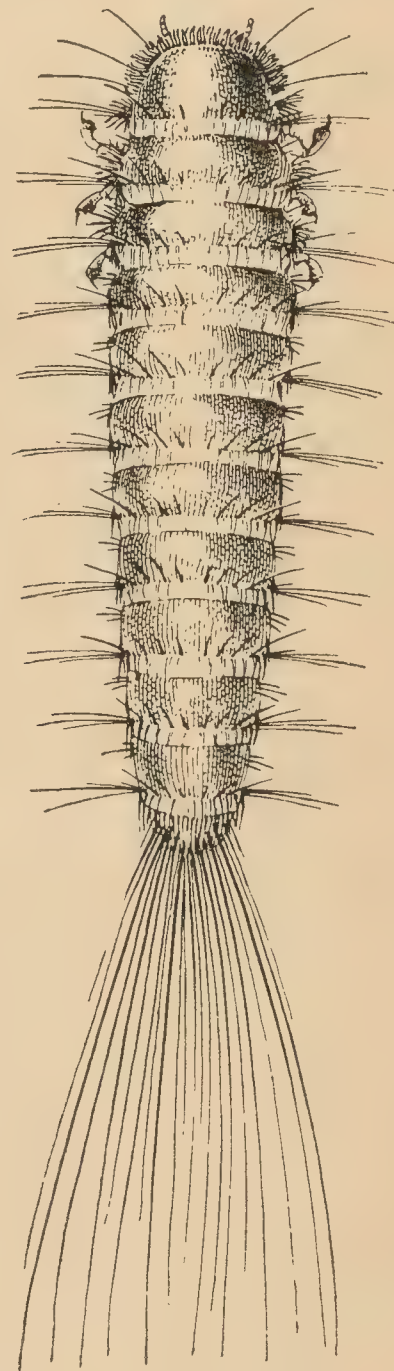
Elm Leaf Beetle.

In bottles and vials and pill bottles, by mail and by telephone, "bugs" and inquiries about them have been pouring in to the Society's new Department of Insects.

The reason is obvious. Elm Leaf Beetles are not a household pest. They do not eat indoors, but merely come indoors to hibernate. When the urge of spring is upon them, they fly to the near-

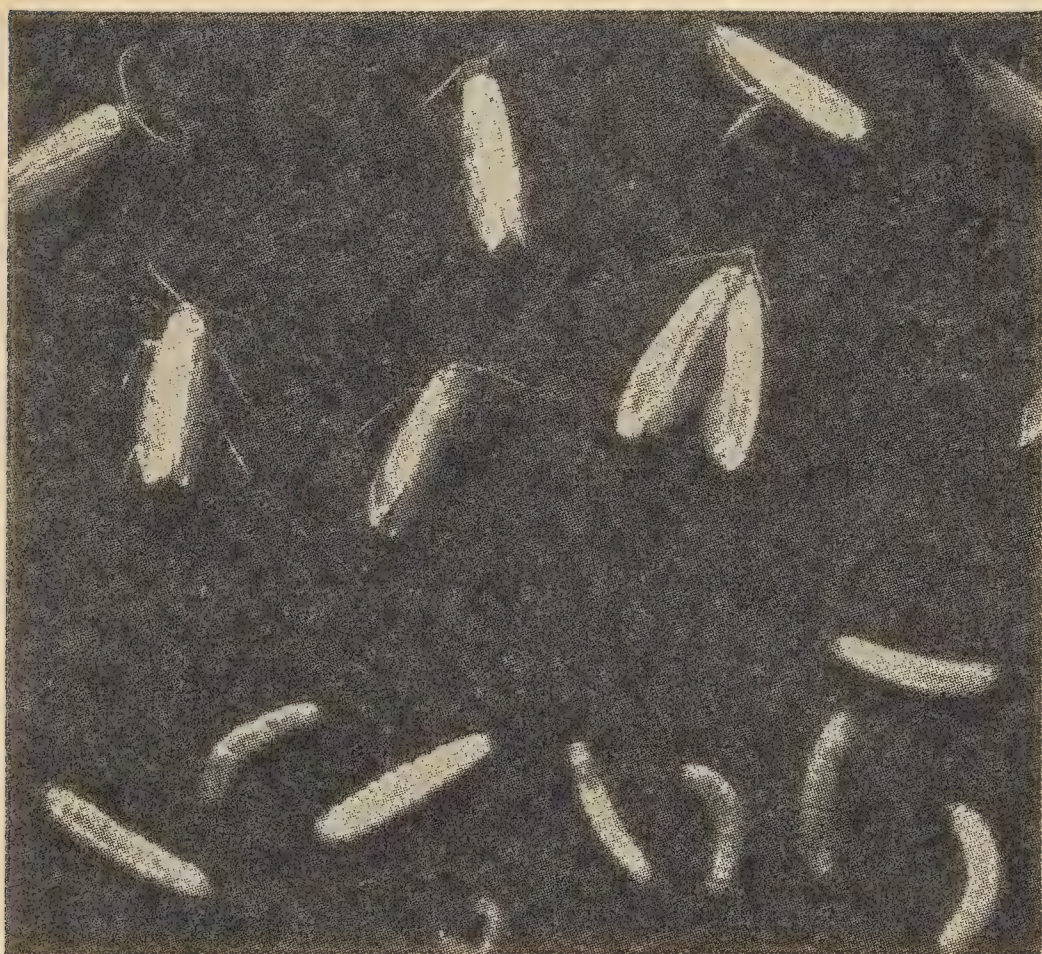


The Black Carpet Beetle (adult above) is sometimes confused with the Elm Leaf Beetle. The adult is said to feed on pollen. The larva (right) damages clothes, fur, and even eats feathers.



est window in a frantic endeavor to escape. A vacuum cleaner or a dust pan and brush is a handy tool to dispose of them in this condition. Out-of-doors they are best controlled by applying an arsenical spray to both top and bottom side of elm foliage.

In the same mail with Elm Leaf Beetles have come Black Carpet Beetles² from New Jersey and elsewhere. Amateurs are very apt to confuse them with the Elm Leaf Beetles, although the Black Carpet Beetle is somewhat smaller and not marked with yellow. Black Carpet Beetles may get into houses by concealing themselves in floral pieces, especially spiraea blossoms, or by impartially alighting upon garments in public places. Whereas the adults are said to feed mostly on pollen and are readily attracted to light, their hairy, bushy-tailed, carrot-shaped offspring consume woollens, furs, and feathers and remain hidden. They even attack mounted insect specimens, as any ardent collector knows too well. Since they do not leave a trail of webbing over the object of their attack, after the manner of a Webbing Clothes Moth³ larva, the first evidence that most people have of their presence is the observance of damaging holes.



The larvae of the Webbing Clothes Moth (various stages of development shown above) are comparatively easy to detect. They leave a trail of webbing.

Clothing frequently brushed and aired, or rugs and furniture in daily use, are seldom attacked by carpet beetles. Proper fumigation will kill the pests in all stages of development. Garments kept in cold storage at temperatures below 40° F. will not be consumed even though they are infested, and garments steam cleaned and then packed in tight paper bags will go unmolested. A small amount of lint in floor cracks, beneath mop boards and in heat convectors, however, is sufficient to maintain a vigorous colony of carpet beetles for an extended period. Often an un-

emptied carpet sweeper or vacuum cleaner bag is an innocent trouble breeder.

Many householders have been unduly alarmed by the sudden appearance of Indian Meal Moths⁴ which resemble clothes moths. Both species wrap themselves with their wings when in repose, but the Indian Meal Moth alone has the outer half of its front wings decked with reddish-brown scales. The clothes moths are attracted to electric lights which their Indian kin seem to shun. Caterpillars of both the Webbing Clothes Moth and the Indian Meal Moth spin ropes of silk that reveal their presence to discerning observers, but the one does so upon fabrics whereas the other chooses stored foods — especially grain. Indian Meal Moths are best controlled in private dwellings by destroying all infested products and thoroughly cleaning floors and shelves.



Indian Meal Moth

On two successive days a box of insects was received with the request that the sender be informed how to protect his property against them. The specimens were identified as Large Carpenter Bees⁵ which are not unlike bumblebees, except that they lack a hairy abdomen and pollen baskets on their hind legs. Instead of nesting in the ground, they choose the hard way by gnawing tunnels into fence posts, trees and buildings. They are not averse to utilizing a deserted tunnel of last year's vintage or earlier. Like some spe-



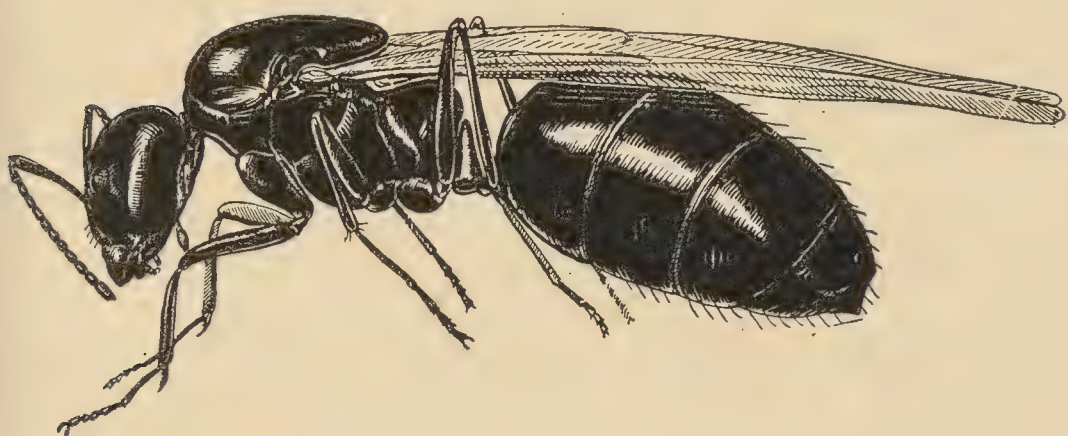
The Large Carpenter Bee has puzzled many persons. It is seldom destructive, but it can sting badly.

cies of bumblebees, they make a direct approach in gathering nectar by biting through deep flower goblets instead of diving into them.

In preparing a nest a Large Carpenter Bee may spend two days or more in gnawing across grain until its body disappears from sight, when it will sink a shaft down some twelve inches or more. This shaft it later divides with sawdust partitions into many chambers that rise one above the other. Each chamber is stocked with a mass of pollen and honey and an egg. In due time the eggs hatch, the food is consumed, and the adult bees gain their freedom.

Foresight is a major virtue of the parent carpenter bee since it provides admirably for the future of offspring which presumably it never sees.

Since Large Carpenter Bees are not colonial, they seldom are very destructive. But they can



This is the Carpenter Ant, often mistaken for the destructive Termite. The Ants merely nest in wood.

deliver a powerful sting. And they are persistent creatures, for once a tunnel is begun it is difficult to discourage them from its completion. They are not known to attack painted surfaces, although they will burrow into painted boards from behind.

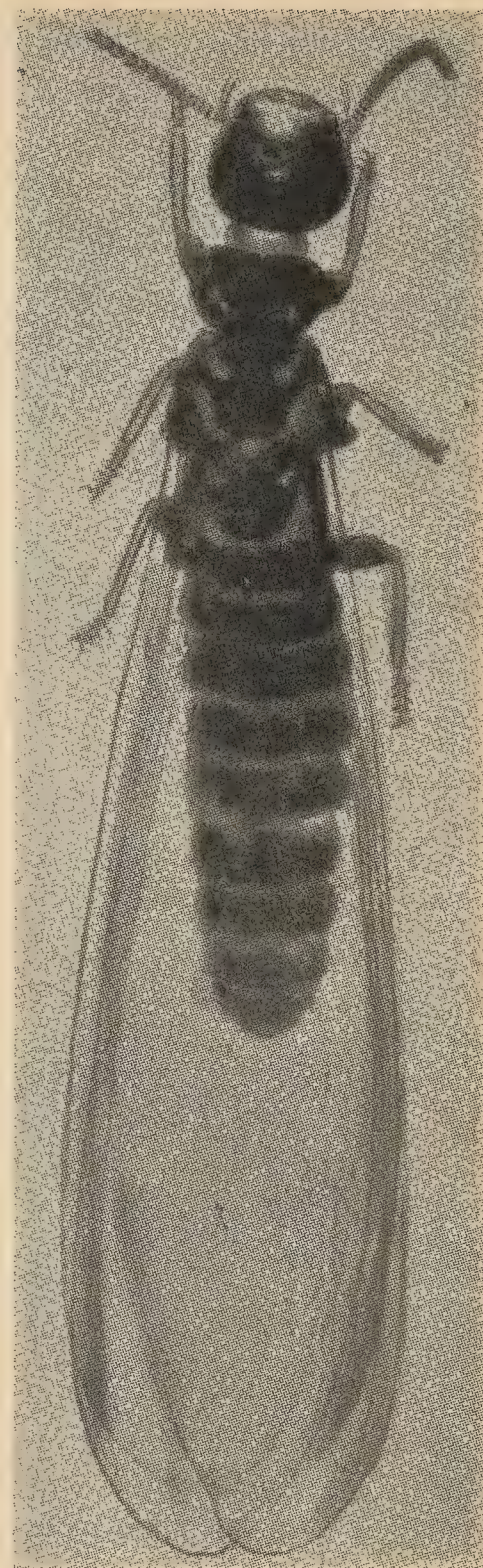
Of quite a different nature is the problem of Carpenter Ants⁶ and Termites.⁷ The latter are notoriously destructive to wooden buildings and the former can cause considerable damage. Too often their identification is confused, which leads to trouble when control measures are applied. Only last week a disagreement among so-called professionals was settled by recourse to this Department. One party claimed a certain building was being attacked by Termites, whereas the other party insisted they were Carpenter Ants. The price quoted for their control varied more than two hundred dollars. This was a serious matter. An examination of a submitted specimen proved beyond a doubt that Carpenter Ants were to blame, which saved someone a deal of money.

There is no real reason for confusing the two groups, provided one has recourse to a hand lens.

Both have wingless workers and true males and females that are winged. Both are social creatures, living together in colonies, but there the analogy ends. Termites have no constricted waistline, their antennae are straight, and the wingless workers always stay out of sight unless disturbed, whereas ants have a decidedly constricted waistline, their antennae are elbowed, and the wingless workers do not hesitate to move about freely in the open. Termites eat the wood that they attack and therefore do not eject it from their burrows. Carpenter Ants, on the other hand, merely use the wood as a nesting site, which accounts for the sawdust heaps beneath the outside of their burrows.

Other insect specimens submitted for examination include longhorned beetles that had emerged from fireplace wood. Was it likely that they would lay their eggs in the house timbers? Since the house timbers nowadays are generally of spruce or pine and the beetles submitted were definitely partial to oak and hickory, this was not considered likely. Neither was it considered probable that American Dog Ticks⁸ would spread Rocky Mountain fever in this locality, since the disease is of rare occurrence in New York.

Although the major task of the Insect Department at the New York Zoological Park is to plan an Insect House for erection in the post-war period, the insect identification and control service now being furnished is beating a well worn path to our door.



The Termite, eater of wood.

¹ *Galerucella xanthomelaena* Schrank.

² *Attagenus piceus* Oliv.

³ *Tineola bisselliella* Hummel.

⁴ *Plodia interpunctella* Hubner.

⁵ *Xylocopa virginica* Drury.

⁶ *Camponotus herculeanus pennsylvanicus* De G.

⁷ *Reticulitermes flavipes* Kol.

⁸ *Dermacentor variabilis* Say.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

Gray-lag—Ancestor of the Geese that Saved Rome

The origins of our numerous domesticated mammals and birds are the subject of constant speculation, turning up with remarkable frequency in our contacts with the question-asking public. Most of these origins, unfortunately, are so lost in obscurity that they are no longer discernible, and, at least in the case of most mammals, we have only speculation to guide us. Most birds, however, have either varied so little or have retained such obviously ancestral characters, that we are able to speak with more certainty.

The Gray-lag Goose (see the cover of this issue of *ANIMAL KINGDOM*), for instance, may safely be presumed to be the ancestral form from which our ordinary domestic breeds were derived. The Gray-lag breeds, or at least once bred, straight across northern Europe and Asia. Just which race of early humans first caught and tamed the downy goslings is difficult to say, for there are Egyptian records of domesticated geese that pre-date those of ancient Rome. But in any case, large flocks are said to have been driven to Rome each year from the northwest. These may have come only from suburban areas or, as seems more likely, they may have originated in barbaric lands that lay in that direction. There were both gray and white birds in these flocks, and from them must have come the famous white geese that are credited with having aroused the soldiery and saved the city from assault in 365 B.C.

At any rate, the fact remains that of the two principal domestic breeds today, one is brown, the other white. The great Toulouse, with unfattened ganders running to 25 pounds or more, is almost indistinguishable, as far as color goes, from the wild Gray-lag. The lovely snow-white Embden, with its pale blue eyes and almost equal bulk, must look not unlike those prized white birds of the ancient Empire.

Visitors to the Zoological Park interested in such matters can now see a Gray-lag in the lake just east of the Zebra House, and carry a mental image of the Farm-in-the-Zoo, where both Toulouse and Embden are shown.

—LEE S. CRANDALL

Pete's Birthday

Until a short time ago, we thought that "Pete," our elderly Hippopotamus, was certainly the oldest specimen of his kind in any zoological garden. Now it appears that he *may* be — his absolute right to the title is clouded by the uncertainties of the war.

Pete was 42 years old on July 13, thereby beating the best *published* record for Hippopotamus longevity, which was 41 years, 7 months and 29 days established by a specimen in the Paris Zoo in the last century.

Some time ago we received a communication from Major S. S. Flower, the British zoologist whose longevity records are frequently cited. He reported that there have been two long-lived Hippopotamuses in the Amsterdam Zoological Garden:

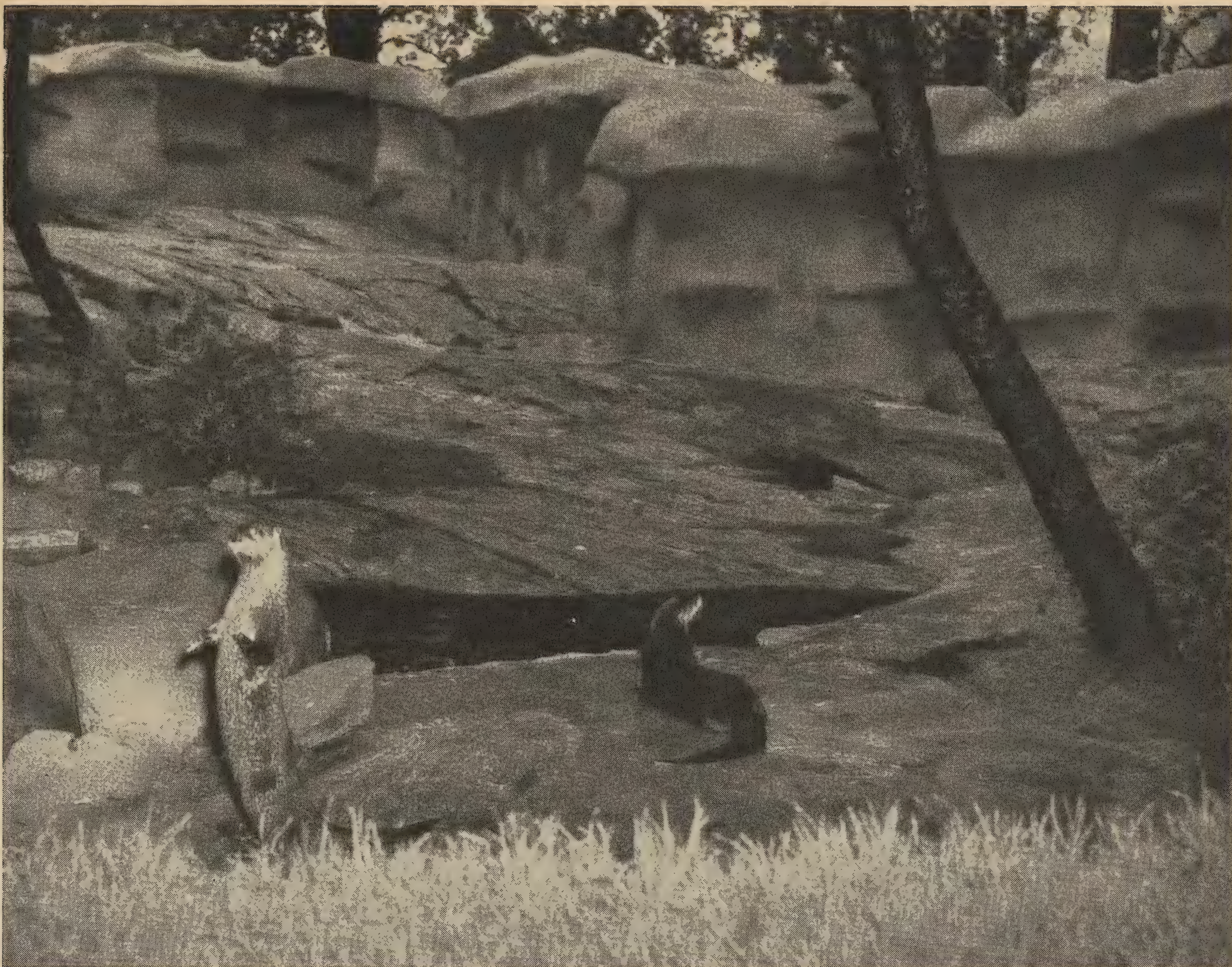
"Betty I, received in 1860, lived there for about 36 years.

"Betsy II was presented 29 March, 1898, when about 18 months old. The last time I saw her was 4 June, 1939, when she was about 42 years 8 months in age. Since then, unfortunately, we have no news from Amsterdam."

Major Flower pointed out in his letter that Pete holds the record for a male hippo.

It should shortly be possible to get further word from the Amsterdam Zoo, to determine whether Betsy II survived the war years. If she did, she still has a considerable advantage over Pete in the matter of age.

However, Pete's health and general well-being continue unexcelled, and he seems good for many more years.



The curiosity of Otters is notoriously great, and when our animals are not disporting themselves in their broad pool, or exploring every inch of their large yard, they like to stand up and stare right back at the visitors. A grassy bank hides the moat that confines the Otters to their pool and yard.

The "Otter Yard" Is Our Newest Exhibit

For the first time in the Zoological Park's history, we have a really superb place to exhibit Otters. The new "Otter Yard" on the site of the old Wild Turkey Range, in the center of the Zoological Park, was informally opened on July 7 when two fine young specimens of the northern Otter were given their liberty in the big pool and yard. They took to it instantly, explored the whole yard minutely and then settled down to playing in the broad pool.

Up to now they have not used their smooth slide into the pool; that "facility" was given them on the chance that they might take a liking to it and indulge in one of their most engaging habits. There is still a good chance that they will make use of the slide this winter when it is covered with ice.

Further planting of the Otter Yard remains to be done, but already it has proved that it is "workable" from a maintenance standpoint and that the Otters like it very much.

Capt. Hein Cited

Capt. Albert F. Hein, formerly a maintenance foreman in the Zoological Park before he entered the Army in February, 1942, has been cited for "meritorious achievement" for his work in Germany. The citation states that "during combat he resorted to ingenious innovations and expedients to restore radio and wire nets disrupted by the enemy action. By personally operating radios and switchboards during night periods Captain Hein has given his exhausted men a few additional hours of rest. He fearlessly exposed himself to direct enemy fire when his presence was required to supervise the communications network."

Plenty of Questions Are Asked at Question House

Since its opening to the public on Members' Day, June 14, Question House has been one of the busiest spots in the Zoological Park, with as many as 1,500 visitors on a single day. Not all of the 1,500 asked questions, fortunately!

In the first full month of operation, the attendants recorded 1,200 serious questions about animal life from visitors to the Zoological Park. Facetious or pointless questions have proved to be very few; it is obvious that most of the questioners want to know the "why" or "how" or "what" of some matter of zoological information, and the attendants have been able to give an immediate answer to the great majority of the questions. Those that require any considerable searching of reference books are answered by mail.

A series of wall paintings by Matthew Kal-

menoff, illustrating longevity, size, gestation periods and myths about animals, have attracted many visitors and induce some of them to ask further questions.

Question House has already established itself as one of the most valuable of the educational services of the Zoological Society.

"Rainey Gate Aviary"

For some reason that is not entirely clear, the bronze trees in the Rainey Gate of the Zoological Park exert a fascination for birds and Robins, Sparrows and Starlings nest among their inflexible branches each spring. This year the Sparrows and Starlings preempted all the better nesting sites near the top, and a Robin was forced to build on the lower hinge of the outgoing gate, where she has reared three nestlings.

Mallards invariably explore the pachysandra beds near the gate and usually nest there. One



One or more attendants is always on duty in Question House, ready to talk to visitors who stroll in. Behind the counter is a shelf of reference books for quick consultation, and the staff is finding that it can answer an increasingly large proportion of questions offhand, for questions often recur.

brood of 14 ducklings hatched in mid-May and Gateman Ray Engle stopped all traffic at the gate for ten minutes while the ducklings crossed the road. They were halted for a time by the barrier of a curbstone too high for them to jump, but Mr. Engle and a police officer herded them along the curb to an off-branching road that led in the direction of Cope Lake. When last seen they were scrambling through a wire fence and heading for the water.

Dr. Dochez Honored

Dr. A. Raymond Dochez, a Fellow of the Zoological Society and a member of our Sci-

entific Council, has been appointed to membership on a Research Board for National Security which will carry on in peacetime the work of two wartime groups, the National Defense Research Committee (NDRC) and the Office of Scientific Research and Development (OSRD).

The contributions of the NDRC and the OSRD toward the war effort "have been outstanding, nay, perhaps even deciding, factors in winning the war," the *Report* of the National Research Council states.

Dr. Dochez is Professor of Experimental Medicine and Surgery at the Columbia University Medical Center.

We Have Two of the Rarest Chicks in the World!

By LEE S. CRANDALL

Last year our pair of Wattled Cranes hatched the first young bird of this fine and stately species ever produced by captive birds. The great event occurred on July 26, 1944, so that at the end of October the youngster was only three months old. Since the Wattled Crane is a native of eastern and southern Africa we suppose that, like other African cranes, it is unable to endure low temperatures. Consequently, to avoid the risk of early November frosts, we had to put the little family indoors. From that day on, the youngster never seemed to thrive, and it finally died on November 25.

Young cranes grow at a remarkable rate, consuming immense quantities of food. For this reason they are notoriously "soft" and slip back with equal speed if the supply of food is reduced. For some reason not entirely clear to us, the young Wattled Crane never fed properly indoors, and to this we attribute his loss.

This year another youngster has been hatched, the required thirty-six days being completed on May 31. It therefore has an advantage of nearly two months over last year's bird, so that it will be much further advanced when cold weather comes. Also, the youngster is already being trained to feed from the receptacle it will use indoors.

* * *

Since 1939, pheasant breeders have been striving to preserve flocks of the many fine species

established in captivity, with emphasis, of course, on the rarer kinds. One of the most-sought pheasants, since its introduction from Annam by Jean Delacour in 1923, is Rheinart's Argus, certainly the finest of this superb group.

The captive stock of this species, never very large, seems to have dwindled to whatever may remain in the London Zoo and the single pair in our own collection. These birds were presented to us in 1941 by Mr. Esmond B. Martin.

We have been unsuccessful in breeding from them until this year, when the female deposited her clutch of two eggs in a basket set under the shelter in the Phipps Aviary. On July 12 she brought off a single chick, which so far has grown well. It has the amusing habit of all Argus chicks of straining every muscle — and all its ingenuity — to remain under the protection of its mother's ample tail.

PUBLICATIONS OF INTEREST

"The Family Anatidae"

Something very important has happened in the scientific world (which is only another name for the world of truth), and this thing has been brought about through the efforts of two Fellows of our Zoological Society. Dr. Ernst Mayr and Captain Jean Delacour have published a paper in a mid-western ornithological magazine with the title "The Family Anatidae."¹

¹ WILSON BULLETIN, Vol. 57, No. 1, March, 1945, pp. 1-55.

"So what?" the lay reader of *ANIMAL KINGDOM* may ask. Simply that for the first time in the study of evolution we are able to see the various forms of swans, geese and ducks more nearly as they have developed on the earth.

For decades we have been satisfied to shoot full-grown ducks, measure them, describe their patterns and colors, bills and feet, give them a name, label them and add sex, locality and date. More and more of their fellows join them in their museum drawer, each adding its mite of value. But each specimen represents only the external aspect of a momentary cross-section in the life of an individual duck. These birds have been known to live many years and from egg and duckling to death they have been concerned with a host of changes — physical, instinctive and emotional. They develop in an egg of definite size, shape, color and surface; as ducklings they wear a suit of down of characteristic pattern and color. They search for food in various places, and their wings, necks, legs and bills are fashioned in accordance. They call to one another in sundry quacks, honks, whistles or trumpeting, all different, all with receptive ears especially attuned. They instinctively differentiate friend and foe, and develop cunning methods of defense. When breeding time arrives voices change, vocabularies increase, courtships begin of flight, swimming, diving, posturing, which win mates, and the marriage lasts for a day, a season or a lifetime. They spend their life within a circumscribed area or they migrate thousands of miles.

In the smooth-plumaged, supine, duck skin, invaluable though it is, lying with its legs neatly crossed, these phenomena have no reality. Yet each one has its place as a factor of greater or less significance in the past and present interrelationships of all wild fowl. Mayr and Delacour for the first time have added these living, vital phases of life to the consideration of the epidermal characters of the preserved skin. They have brought about a unification of life and death and this is a very great innovation in the study of terrestrial evolution.

To those of us carrying on scientific work in the Department of Tropical Research in the Zoological Society this new departure is very heartening; it means a renewed vindication of the main objects of our expeditions, past, present

and future, and reemphasizes the potential value of our hosts of photographs, paintings and ecological notes awaiting publication. The new treatment of the ducks is precisely what I and my staff are endeavoring to achieve in tropical lizards, certain families of birds, fiddler crabs and salticid spiders. And if such a thing were needed, all this would indicate the superlative worth of the observational and experimental researches on living animals of the proposed Science Center of the Zoological Society.

WILLIAM BEEBE

Rancho Grande Field Station,
Maracay, Venezuela.

JUDY AT THE ZOO. Story by Tom Maloney, Pictures by Jerry Cooke. 52 pp., 26 photographic illus. U.S. Camera Publishing Corp., New York, 1945. \$1.00.

The best way to see the Children's Zoo is to visit it as a guest of an eager six-year-old. (Indeed, it is the *only* way, for adults are not admitted unless accompanied by a child.)

The author and the photographer of "Judy at the Zoo" found the perfect hostess for their visit. Judy, about six, all smiles and eagerness to pet every animal in sight, made the rounds of the Children's Zoo in the Bronx Zoo while the camera clicked, and the result is an entrancing picture-and-story record that carries Judy from her first approach to the Children's Zoo — handing her ticket personally to the uniformed attendant — to the breathless end where she says good-bye to Patches, the Llama, and goes out past Deacon, the Talking Crow.

As a souvenir of the Bronx Zoo's Children's Zoo, "Judy at the Zoo" is hard to beat and it will remind many youngsters of happy hours.

THEY ALL SAW IT. Photographs by Ylla, Words by Margaret Wise Brown. 32 pages, 15 photographs. Harper & Bros., New York, 1944. \$1.50.

Ylla is one of the outstanding photographers of animals, with a reputation in the United States as great as that she enjoyed in Europe before the war. This large but thin book, half full-page photographs of animals, half one- or two-line text creating suspense as to what the animals saw that set them all agog, is a collection of some of her most striking photographs. It is an entertaining picture book for children and the only regrettable thing about it is that none of the pictures happened to have been taken in the Bronx Zoo, which her friends consider Ylla's second home!

ANIMAL KINGDOM



THE MAGAZINE OF
THE NEW YORK ZOOLOGICAL SOCIETY



NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York 20, N. Y.

PRESIDENT

Fairfield Osborn

FIRST VICE-PRESIDENT

Alfred Ely

SECOND VICE-PRESIDENT

Laurance S. Rockefeller

SECRETARY

Harold J. O'Connell

TREASURER

Cornelius R. Agnew

EXECUTIVE COMMITTEE

Fairfield Osborn, *Chairman*

Cornelius R. Agnew
Alfred Ely
De Forest Grant

Warren Kinney
William De Forest Manice

David H. McAlpin
Robert Moses

Harold J. O'Connell
Laurance S. Rockefeller
J. Watson Webb

BOARD OF TRUSTEES

Class of 1946

George Gordon Battle
George C. Clark
F. Trubee Davison

Jay Downer
Robert I. Gannon

Robert Gordon McKay
Fairfield Osborn

Laurance S. Rockefeller
John M. Schiff
Frederic C. Walcott

Class of 1947

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez

De Forest Grant
Eugene Holman
Warren Kinney

Henry R. Luce
William De Forest Manice
Harold J. O'Connell

Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1948

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely

Marshall Field
Childs Frick
Archer M. Huntington

David H. McAlpin
John H. H. Phipps

Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Ex-officio, The City of New York

The Mayor, Hon. Fiorello H. LaGuardia

Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

John Tee-Van *Executive Secretary*

Jean Delacour *Technical Adviser*

Sam Dunton *Photographer*

William Bridges . . . *Editor & Curator, Publications*

Edward Kearney . . . *Manager, Facilities Dept.*

Sanford Miles *Comptroller*

Quentin Melling Schubert, *Superintendent, Construction and Maintenance*

ZOOLOGICAL PARK

Lee S. Crandall . *General Curator & Curator of Birds* Leonard J. Goss *Veterinarian*

Brayton Eddy *Curator of Insects & Acting Curator of Reptiles*

Grace Davall *Assistant to General Curator*

W. Reid Blair *Director Emeritus*

William Beebe *Honorary Curator, Birds*

AQUARIUM

Christopher W. Coates . . . *Curator and Aquarist*

C. M. Breder, Jr. . . *Research Associate in Ichthyology*

Ross F. Nigrelli *Pathologist*

George M. Smith . . *Research Associate in Pathology*

Myron Gordon *Assistant Curator*

Homer W. Smith . . *Research Associate in Physiology*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*

Jocelyn Crane *Research Zoologist*

Henry Fleming *Entomologist*

George Swanson *Staff Artist*

Associates

William K. Gregory
John Tee-Van

Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE
NEW YORK ZOOLOGICAL SOCIETY

VOL. XLVIII

OCTOBER 8, 1945

No. 5

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York 20, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York 60, N. Y. Title registered with United States Patent Office.

Subscription, \$1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

The Purpose of This Society

The Zoological Society needs help. Somehow the opportunities that lie before it must be met. To help, you need to have but a single, simple conviction: that one of the worst things that can happen to human beings at this critical stage of civilization is to fail to receive a full share of the recreation, the understanding, the *vision* that come from Nature. The wonderful and diverse living things of this earth are the dynamic expressions of Nature's processes. In its broadest terms, the purpose of the Society is to bring this boon, this vision to the public—not only to the people of this great city, but to the nation, and, through publications, films and radio, even to the world at large.

Fairfield Osborn

IN THIS ISSUE

Osprey Coming Into Her Nest	Eliot Porter	COVER
The Significant Future of the Zoological Society	Fairfield Osborn	123
The Rare, the Strange, and the Beautiful	William Bridges	126
Perspective on the Zoological Society	Jean Delacour	135
Babies in the Zoo		138
Presenting — Bees and a Bee Tree	Brayton Eddy	141
Another Great Plan for This Society's Future	Donald T. Carlisle	146
"Let's Go to the Zoo!"		149
We Carry the Society Into the Jungle	William Beebe	152
Behind the Scenes: News and Notes		158



The African Plains as we plan the extension of
this great exhibit will be a living, exciting pan-
orama of birds and mammals of the continent.
From a painting by Matthew Kalmenoff

The Significant Future of the Zoological Society

By FAIRFIELD OSBORN

*President of the New York
Zoological Society*

OUR INSTITUTION stands at the threshold of a period of resurgence and of far-reaching development. The opportunities that lie ahead are manifold and so significant that one is filled with a sense of faith and confidence that they will be met. There is no possibility, however, of meeting them unless those who believe in the purposes of the Society are prepared to provide financial support of an extremely substantial nature. This article provides a general description of the plans that have been made for the future and pleads for the support that will translate them into reality.

The founders of the Society were men of extraordinary outlook and foresight. For fifty years its original Charter has been fully adequate for all its purposes. This holds equally true today. Every plan and concept that we have for the future is related directly to the four great purposes for which the institution was created. They are as follows:

Management of public institutions designed to exhibit the animal life of this earth.

Popular education in zoology.

Scientific research.

Conservation of animal life and preservation of natural areas.

There follows a brief description of the major plans that await fulfillment, given in the order expressed above.

Zoological Park

During the war period extensive plans have been completed for the modernization and development of the Zoological Park. If these plans can be carried into effect the word "Zoo" will

Now is the time to act on the plans we have been making all through the war years. This is the first article of a series on our needs and opportunities.

hold entirely new implications, for the net result will be that the four great classes of land-living animals—mammals, birds, reptiles and insects—will be shown in the full beauty of environmental backgrounds and in the main according to their continental origins. At the present time a relatively small part of the Park comes up to the standard which we believe it should have. Fine as the original buildings are in their architectural design, and beautiful as are the Park terrain and foliage, the fact remains that the methods of exhibition both within the buildings themselves and in the outside areas have now become outmoded. It is true that within the last few years a series of improvements has been made. Two units exhibiting the animal life of Africa have come into existence. These have proved an outstanding success. Other improvements, not a few in number, have been made here and there; new techniques have been devised which have proved themselves practicable as well as beautiful and informative. But these efforts are at best merely preliminary and partial. They have fully justified our confidence in planning to adopt them generally. At the present time approximately 110 acres are developed for zoological display. Plans have been completed for the development of an additional 60 acres, carrying the Zoo itself over to the borders of Lake Agassiz, the Bronx River ravine and the beautiful lake that lies

below it. These plans involve the completion of *Africa* and the creation of an area for exhibition of the animals of North America as well as one for the animals of Eurasia. Ultimately it is hoped that we shall have areas for the animal life of South America as well as Australia. In view of the fact that the Park now has adequate and substantial buildings, future plans provide only for four large new buildings. One of these is for the exhibition of the anthropoid apes, another for a large central restaurant. In addition a new building for the smaller monkeys and mammals is badly needed and it is quite clear that we must have a building for the exhibition of insect life. The new Insect Department, the first of its kind in any Zoological Park, has already met with broad popular response. It is believed that a special building emphasizing the inter-relationships of insect and human life, will unquestionably prove one of the major drawing cards of the future Zoo.

The New Aquarium

It will be recalled that the old Aquarium at the Battery, managed by the Society for four decades, was closed in the Autumn of 1941 due to the encroachment of the proposed Brooklyn-Battery tunnel. Shortly thereafter at the request of the City government, the Society set about to prepare plans for a great new Aquarium. These plans have been completed. They are original and compelling. At the entrance to the building there will be presented a striking dioramic interpretation of the cycle of water and of the aquatic life that inhabits each successive area, namely mountain spring, up-land stream, pond, river and ocean. Large tanks giving the illusion of limitless space, will contain rays, sharks and mammoth sea turtles. There will be two vast outdoor tanks, some 70 feet long by 30 feet wide, with both over-water and under-water views which will contain large marine forms such as Stellar sea-lions, walruses, porpoises, seals, sea otters, together with some of the larger forms of marine birds. The plans further provide for two large exhibit areas with both over-water and under-water views of penguins: an air-conditioned enclosure for the King and Emperor penguins from the Antarctic and another for Humboldt penguins of the Pacific and the Blackfoot penguins from the South Atlantic. Adequate laboratory space is provided

for research, an inherent and important activity of this institution.

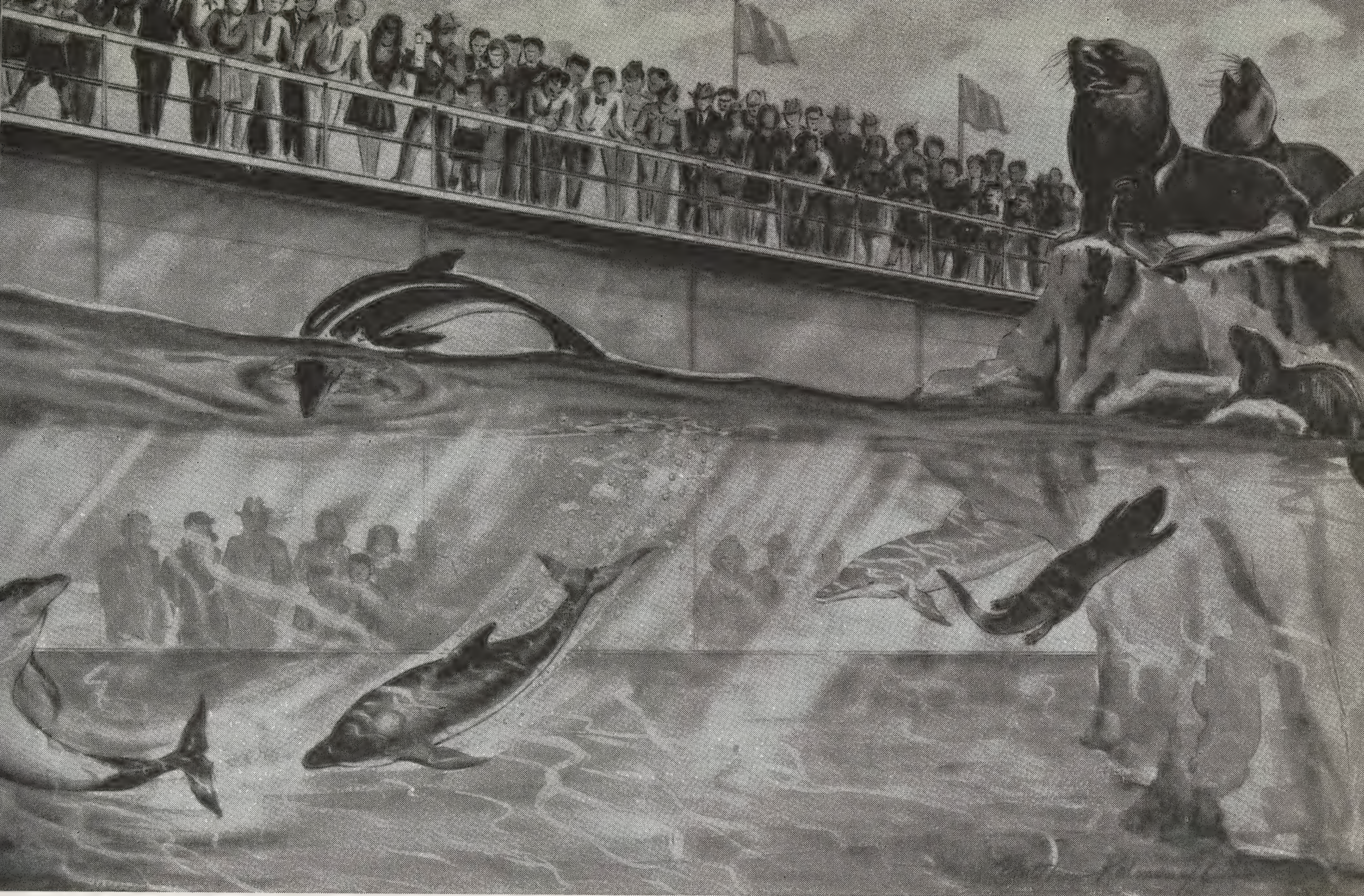
It is not credible that New York will have to go much longer without a great public Aquarium.

Popular Education in Zoology

The potentialities for the extension of the educational work of the Society are only limited by the amount of funds available for this purpose. In general these activities involve the distribution of educational material to the schools of the Greater City of New York and nearby communities, guided tours within the Zoological Park, the publication of books, the preparation of documentary films and the use of the radio. At the present time the Society has such limited funds that it is possible to meet only a fractional part of the opportunities which exist for work in education. The public is thirsty for information about animal life. This fact is brought home to us constantly, both in the Zoological Park itself and in the volume of demands from outside sources. The innovation initiated this Spring through the opening of the Question House, where a trained staff is in attendance to answer serious questions concerning animals, has already proved itself a very real success and substantiates the conviction that the Society should do far more than it is now able to do in the field of popular education.

Scientific Research

Last year a Scientific Advisory Council was formed for the purpose of developing plans for the extension and widening of the Society's work in this field. The men serving on this Council are among the nation's leading scientists associated with great universities, medical schools, or scientific foundations. They have reviewed the long and fruitful history of the Society in biological research and now subscribe to the opinion long held by our trustees and officers that the Society is faced with a great and unusual opportunity and that there should be established in or near the Zoological Park a Research Center where studies can be pursued in an organized manner by members of our own staff and where facilities can be made available for visiting research workers from other institutions. The fields



The life of the sea is continuously active, continuously dramatic—and we know how to present it effectively. This is a sketch by Matthew Kalmenoff of one of the two vast out-of-doors tanks in the new Aquarium as we now plan it. Visitors may observe both from above and below the waterline.

of comparative behavior, physiology, pathology, anatomy and parasitology are all advanced by the study of animal life. For many years the Hospital at the Zoological Park, as well as the Aquarium Laboratories, have kept complete vital statistics of the collections including full recordings of disease conditions and causes of death. Many medical schools, universities, colleges and individual scientists regularly call upon our staff for information or material. The time has now come for the coordination and extension of this vital work, to be organized under a competent directive head.

Within the year the Society's Tropical Research Department has concluded arrangements for the establishment of a biological research station in Venezuela. This is an event of substantial importance and it is greatly to be hoped that the Society may be able to carry this forward as a long-term project both for the work of its own staff and for the scientific men of other institutions.

Conservation

One of the most important purposes of the

Society is the extension of popular understanding concerning the relationship of man with all other kinds of living things. Man is derived from Nature and though he has the caress of Divinity on his brow—and a touch of the devil—he is only “lord of the universe” to the degree that he realizes the need for his being a good trustee. The more his power increases, as indeed and in many ways unfortunately it has, the greater the need that he act in trust and protect the other living things of this earth, not for their benefit alone, but for the very continuing existence of man himself.

The Society from its earliest years has been a leader in the field of wildlife conservation. Today a new concept is forced upon us. It is based on the fact that the existence of all wild animal life depends upon the maintenance of the forests, soils and streams. These living resources are also the basis of the survival of man himself. The Society, while continuing its energetic support of the preservation of wildlife, needs at the same time to broaden its efforts in arousing public consciousness to the fateful destruction of living resources both here and in other parts of the world.

The Rare, the Strange, and the Beautiful

By WILLIAM BRIDGES

THE WORLD is still full of rare, strange, and beautiful animals that have never, or seldom, been seen in any Zoological garden. Rarities have come out of the wilderness at an accelerated rate in the last half-century — the Giant Panda is only the latest — but plenty are left. Indeed, the list of mammals alone could be extended to fill this page — all of them “snarks,” as one Zoo director calls the prize animals of his collection.

Some day soon the world will settle down and then the New York Zoological Society intends to begin a systematic combing of the wild places. It is already thinking of sending its own expeditions to Malaysia, Indo-China, Africa. Transformation of the Zoological Park, as we are planning it, will give extraordinary opportunities for display. The Zoological Park is ripe for a great surge forward and if the “air age” is actually upon us, as newspapers and magazines give daily assurance, travel and collecting and transportation of animals will be simpler than ever before.

Here is an abbreviated list of mammal rarities we may reasonably hope some day to see in the New York Zoological Park. Almost all of them have been exhibited somewhere at least once, but they are authentic rarities for all that.

Aye-Aye

A primitive, Lemur-like Primate found only in Madagascar. Huge ears, long, bony middle finger, a big and bushy tail.

Pangolin

The Scaly Anteater of Africa and southeastern Asia. Six feet long, armor-plated in tough scales.

Maned Wolf

Neither distinctly maned nor a true Wolf, but a very rare carnivore of central South America.

Proboscis Monkey

A very long-nosed Monkey of Borneo, the most grotesque of all the Primates.

Royal Antelope

The smallest Antelope in the world—only about 10 inches high at the shoulders. Africa.

Tenrec

One of the odd insect-eaters of Madagascar; about 16 inches long; snarp-snouted.

Fossa

A night-prowling carnivore of Madagascar, catlike, long-tailed, slender-bodied.

Kouprey

A great Wild Ox of Indo-China, discovered only about 10 years ago, exhibited only once—in the Paris Zoo.

Takin

The big Goat-Antelope of the Himalayas.

Serow and Goral

Goat-like relatives of both the Goats and the Antelopes, from eastern and southeastern Asia.

Giant Forest Hog

Six feet long, the most spectacular of the wild swine. Forested highlands of Africa.

Yapok

The most beautiful of all the Opossums. A silky-haired, black-and-white Water Opossum of tropical America.

Silky Anteater

Hardly larger than a kitten, with long and silky hair, a prehensile tail. Tropical South America.

Leopard Seal

A gigantic, really fearsome, penguin-eating Seal of the Antarctic seas.

Elephant Seal

The largest of all the Seals—monsters more than 20 feet long, found in the southern seas.

Sumatran Rhinoceros

The smallest Rhinoceros, only about 8 feet long. Two-horned, hairy.

Marco Polo Sheep

One of the finest of the wild Sheep of the world, living high in the Himalayas.

These are a few — a very few, really — of the strange, the rare, and the beautiful animals we want and some day will have.

* * *

On the pages which follow are pictured a selection from the famous animal rarities that the New York Zoological Park has been privileged to exhibit, in the past or at the present time.



KOALA

Australia

Its black, pudgy nose, its bright little eyes and its soft, plushy, gray-brown fur make the Koala one of the most appealing animals in the world. Australians call it the "Native Bear," but it is not a Bear—actually it is a marsupial that zoologists have placed in a family all its own. It feeds only on certain kinds of eucalyptus leaves and therefore is hard to keep in captivity outside its native island continent.



HAITIAN SOLENODON

Haiti

Although it had been known to scientists for more than a hundred years, it was not until the early part of this century that the Haitian Solenodon was brought out for exhibition. It is classed as an insectivore, but its diet apparently includes vegetables, snakes and fruits. Its nearest relative is a form found on the island of Cuba—now almost or actually extinct.



OKAPI

Africa

The term "living fossil" is a loose one; nevertheless, the Okapi comes close to meeting the requirements. Its ancestors are supposed to have died out some 60,000,000 years ago, leaving it as a link between the distant past and the present-day Giraffe. Its home is in the thickest jungle areas of the Belgian Congo and the Okapi now living in the Zoological Park shows its shade-loving nature by avoiding sunlight.



THYLACINE

Tasmania

The bushmen of western Tasmania sometimes see, lurking in the dense forests or skulking through the underbrush, a dog-like, striped animal that they call a "Wolf" or a "Tiger" or a "Hyaena." Actually, the Thylacine is none of these. It is a marsupial, of course, and a carnivore; at one time it was fairly common, but because of its depredations against sheep, it has been exterminated over most of its old range.



DUCK-BILLED PLATYPUS

Australia and Tasmania

The first (and only) Platypus ever exhibited outside its native Australia and Tasmania came to the New York Zoological Park in 1922. It lived 34 days and thousands flocked to see this greatest of zoological rarities. It lays its eggs—usually two—in an underground nest, yet it is a mammal and nurses its young.



BONGO

Africa

This is the handsomest of all the Antelopes, and one of the rarest. It comes from the dense, jungle region of Equatorial Africa and like the Okapi, another forest dweller, dislikes intense sunlight. The adult Bongo now living in the New York Zoological Park is the only one that has been exhibited in the United States.

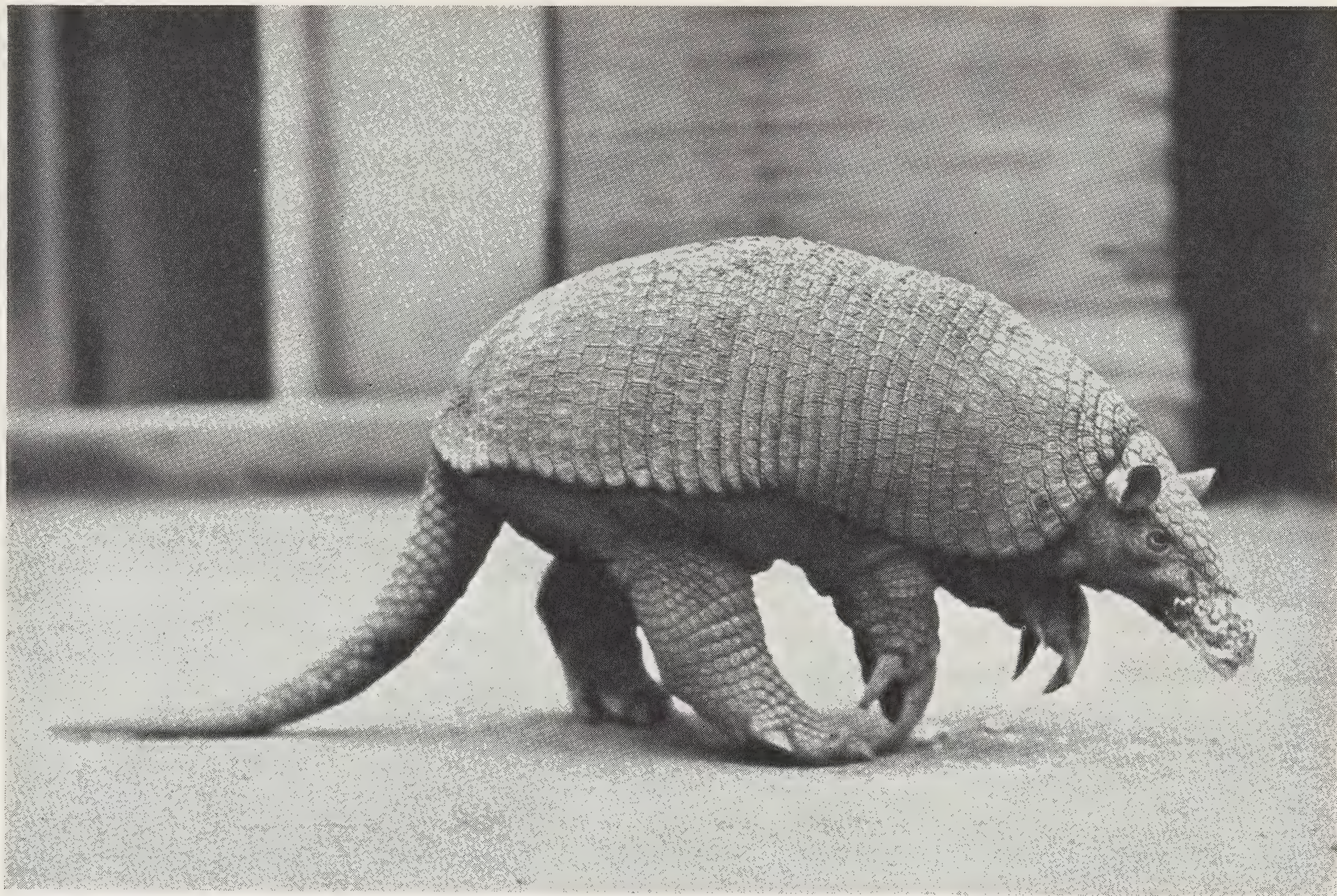


H. Huber Clark Photo

GIANT PANDA

China

To a zoologist, all animals are interesting and important and, technically, there is little to choose between a small and inconspicuous Shrew and a large and showy Giraffe. But now and then some animal seems to have everything—popular appeal and rarity and a special scientific interest. Such is the Giant Panda, a “clown” as far as the public is concerned, a very rare animal that has been seen outside its native habitat only since 1936, and a curious creature that is Bear-like in some ways yet is closer to the Raccoons. The New York Zoological Park has two Giant Pandas.



GIANT ARMADILLO

South America

Animals that we call “giants” today are usually only the largest members of their group, and are “giants” merely in comparison with others of their kind. But the Giant Armadillo is so much larger than the familiar Nine-banded and Six-banded Armadillos—it is about a yard long, exclusive of tail—that it is truly gigantic. It was only about fifteen years ago that the first living specimens were brought out of the jungle.

Some interesting observations on the place we hold among the zoological institutions of the world.

PERSPECTIVE on the ZOOLOGICAL SOCIETY

By JEAN DELACOUR

I AM ONE of the few surviving representatives of a vanishing race—that of the private collectors of living animals. As such, I have had good opportunity to travel extensively over the world and the best of reasons to look observantly at the great public collections of animals in many countries. Nowhere—and I have seen most of the public zoological gardens on every continent—have I found another institution with the burning faith in the educational possibilities and in the scientific study of animal life, and the determination to bring its dreams to fruition, that the New York Zoological Society displays.

To establish my right to speak as positively as I do, I may perhaps be pardoned a reference to my qualifications. I was brought up in Paris in the heyday of the delightful Jardin d'Acclimatation. For many years I have been a Member of the Council of the Zoological Society of London. As an associate of the French National Museum of Natural History I have been active in the administration of the ancient Jardin des Plantes and the modern, moated Vincennes Zoo. I was adviser for the expansion of the Rome Zoo in the early 'Thirties. And, as I say, in the course of world travels to form my own unrivalled but ill-fated collections at Villers-Bretonneux and at



Visitors crowd around the baby Black Leopard, learning new and exciting facts about animals.

Clères, between 1908 and 1940 I visited and studied most of the zoological institutions of the world.

I say it again: the New York Zoological Society is unique in its purposes, ideals and accomplishments.

Practically all zoological gardens, large and small, whether they are run by cities or states or belong to private societies, are purely and simply exhibitions of live animals, confined, as a rule, to mammals, birds and reptiles. Only a few have added insects and an aquarium to incorporate the water-world, or make any attempt at scientific research. Almost universally the efforts at education of visitors have consisted of labels on the exhibits—not always as accurate as could be desired and rarely really explicative.

The best of these institutions, notably the great Zoological Society of London, have attained fame by their scientific publications. The National Zoological Garden in Washington and the Paris Zoos, forming parts of great national establishments of natural history (the Smithsonian Institution and the Museum National d'Histoire Naturelle), have a special position, for in principle the available material and specimens are at the



disposal of specialists for study in different departments. Actually, the very hugeness of their scope has too often proved a hindrance to the smooth working of any such arrangement.

No such institutions, so far as I know, have tried consistently to promote zoological research, education and the preservation of natural resources by direct action.

In these fields, which make a Zoological Society so much more than a "zoo," the New York Zoological Society has always occupied a place of its own. Not by accident or circumstance, but by well-conceived design, since its debut fifty years ago it has combined with the first and all-important aim of exhibiting the best possible collections of animal life the vital corollaries of education, research and conservation.

In the Children's Zoo, contact between children and animals is direct and immediate. Here the wonder of living things unfolds.

My acquaintance with the actual work of the New York Zoological Society goes back not to its very inception, but to its early years, and I have seen and noted with satisfaction how it was willing—nay, anxious—to encourage its scientific staff and to provide means and time for observations and experiments. The crowded files of our scientific publication, *Zoologica*, constitute a monument to the activity of the Zoological Park and Aquarium personnel. Not only outstanding, but unique, is our Department of Tropical Research under Dr. William Beebe. Such names as Madi-



tion of its kind that maintains a fully staffed Department of Education through which its ideas and ideals can be given directly to the public. Motion picture films, lantern slides, photographs, booklets, have been our standard outlet for years; recently our Question House has supplemented, even more directly, these functions and has proved to be a great success.

Elsewhere in this country and abroad I have seen other examples of displays of domestic animals and of special facilities for children; I have seen nowhere anything that approaches in attractiveness and effectiveness our Farm-in-the-Zoo and our Children's Zoo.

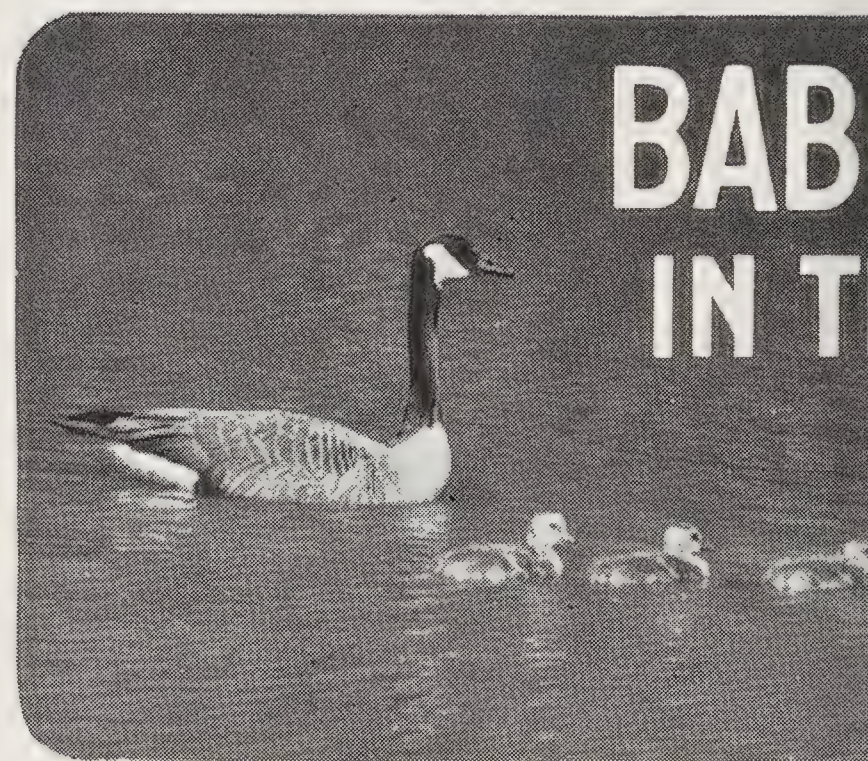
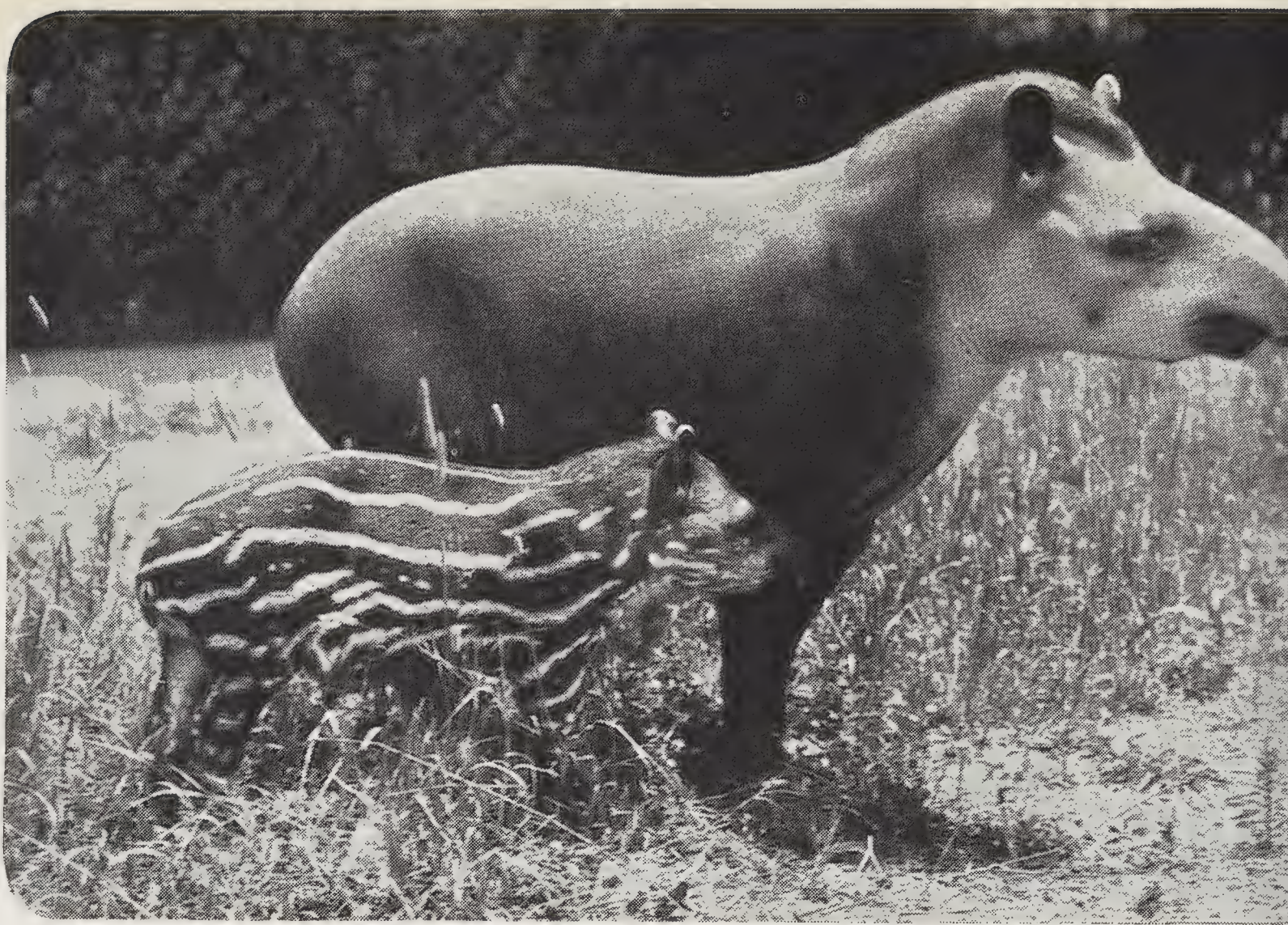
Today the guide book and descriptive labels in the Zoological Park are the best of their kind; they are an admitted standard for other zoological institutions. I am speaking not only of their physical appearance—although in this, too, we are pre-eminent—but of their content and informativeness. In the development of adequate labeling of living exhibits to identify, locate and, if you will, dramatize, each living creature in our collection, we have been encouraged by the receptive curiosity of our visitors. We have discovered that people—the man in the street—will read labels as long as 500 words. We know they want and appreciate information; we have studied them in the process of acquiring it from our exhibits. We *know* that an attractive habitat exhibit compels attention and creates an interest in descriptive labeling. We *know* our attractive and inexpensive booklets about animal life are wanted and appreciated. We *know* there is an avid thirst for the kind of information we are prepared and instituted to give, because every day we see examples of our beliefs in practice.

Yes, the New York Zoological Society is indeed a leader in these combined and inter-related fields of Living Zoology. No similar institution has done so much or so well—has felt the impetus to do so much. But progress must always be made. We want to do more, and better. Fortunately, we know how, and along what concrete, positive lines, progress can be made that will meet very real, very vital needs.

son Grant, Henry Fairfield Osborn, Frederic Walcott, Dr. William T. Hornaday and Dr. C. H. Townsend are inseparable from the accomplishments of the Zoological Society, are inseparable also from magnificent heroic efforts in conservation. Best of all, they were successful efforts—as how else could they be, with such men, such means and such ideals?

I do not say that all the vital ideas and constant seeking for solid accomplishment were in the past, either. Unless I am very much mistaken, the New York Zoological Society is the only institu-

(RIGHT). Many baby animals are simply small editions of their parents. Not so in the case of the South American Tapir. There is no mistaking its babyhood stripes. (BELOW). Little Bagheera, our baby Black Leopard, appears almost wistful here—but actually she was simply contemplating a playful spring at the photographer, which took place a moment later. Hand-reared Bagheera is growing up with a friendly disposition.



(RIGHT). The Great Apes are remarkably "human" in their actions when they are quite small. This is Mike, the young Orang-utan, when he was given a new toy. He played with it for hours and exhausted all its possibilities as a plaything — although he never ceased to be surprised when it bounced and rolled back at him.





(LEFT). Baby Raccoons are appealing as they explore the great new world about them. A little timid in the beginning, one quick motion made them retreat, always returning for another look.



(ABOVE). A Sealion pup stays close to its mother when it is young. (LEFT). Rocky Mountain Goat and her frisky kid. (RIGHT). A baby Llama is an annual occurrence in the Zoological Park. A mother and baby.





(UPPER). Last year's little Tigers—now babies no longer, but huge creatures weighing more than 200 lbs. each. (BELOW). Keedah, a young Gibbon, in a bashful and yet inquisitive mood.



(ABOVE). Zebra colts are not a novelty nowadays, for one is born every year or two—but still they are among the most attractive of animal babies because of their clean, bold, black-and-white marks. (RIGHT). A great event at the Kangaroo House is the arrival of a baby — or, rather, the time when it begins to put its head out of the pouch. This is always several months after the birth of the baby. Then, for months more, it is in and out of the pouch daily.



Presenting— BEES and a BEE TREE

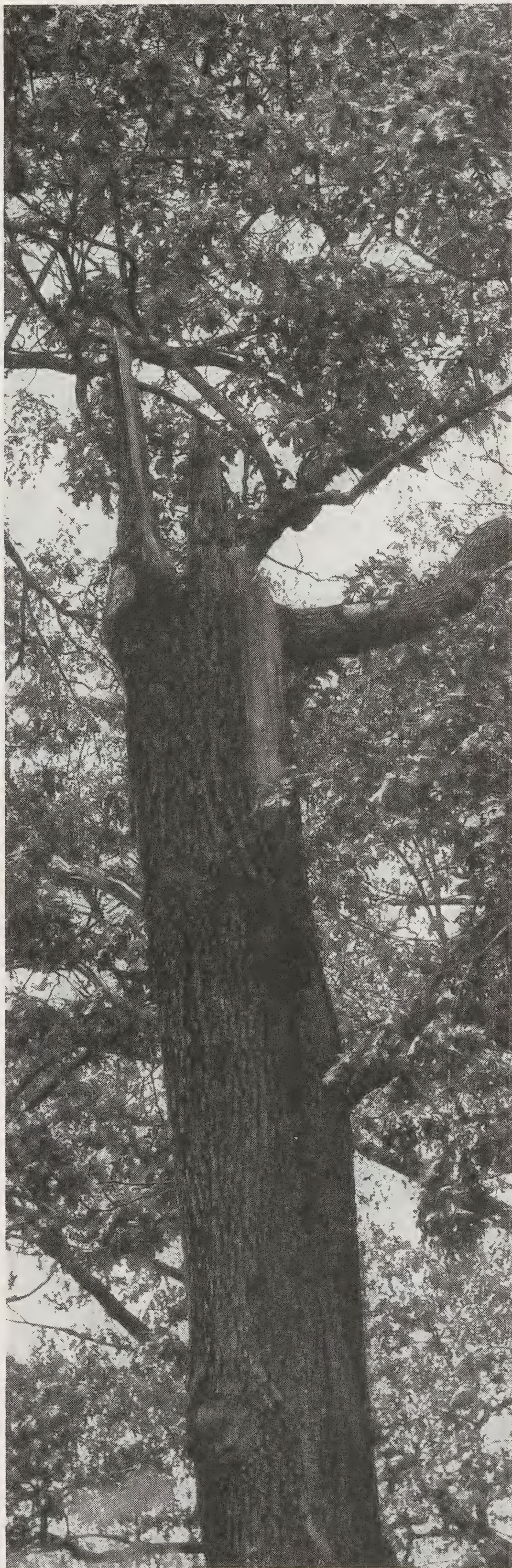
By BRAYTON EDDY

Came a spring storm and the top of a great black oak crashed to the ground, carrying a swarm of angry bees—and a new exhibit.

THE TECHNIQUE of setting up an observation beehive, where the most intimate details of a honeybee organization can safely be noted and admired, is rather well-known. It involves the use of a special glass case and a few pounds of home-grown bees. But to bring in a 500-pound section of bee tree, with some 15,000 wild bees inside, and place it in a woodland scene within a display nook, is something else again. It involves certain unknowns which make the task both challenging and exciting.

Can the feat be accomplished without undue punishment of the persons concerned? Once accomplished, will the bees take kindly to the re-location of their home or will they resent it and move into more stable quarters? If they choose to remain, can they be persuaded to fly in a semi-circle and exit for food through a rear gap in the display nook or will they dash their heads against the public observation window directly in front of them? If they can be induced to wheel and go out-doors, will the bee pastures within an easy flight range of one mile yield sufficient nectar to meet the requirements of the colony? Finally—since a public exhibit is of no consequence unless it can be clearly viewed—will the bees permit a spotlight to be directed into the sanctity of their combs without becoming alarmed?

These questions can now be answered in the affirmative since the bee tree exhibit has been an accomplished fact for two months at the New





The log, as it fell, lay with the split side uppermost and with the comb and the whole colony of bees exposed to the weather. After sawing the upper part of the trunk nearly in two (the saw is visible in the picture), Curator Eddy undertook to remove the sticks and stones boys had thrown into the comb.

York Zoological Park. Bees are flying in and out of the Reptile House window just as if they had been doing so all their lives. Worker bees are building wax comb under the full glare of a spotlight with the same unconcern that veteran actors show on stage. Since the ways of bees are often unpredictable the curtain may have to be drawn at any moment, but present indications are that the drama will continue to unfold at least until cold weather.

In meeting the challenge to bring in a tree with live bees for public observation, certain fundamental bee urges have to be kept clearly in mind. Bees are attracted by light and repelled by smoke. This is important to remember. Bees do not desert their queen without good reason. Consequently, it is unnecessary to exert oneself catering to the whims of individual worker bees so long as royalty is satisfied. Bees return home at nightfall and cluster about their queen. An expedition, therefore, need not be dispatched over the countryside to round up scattered members, since, when darkness sets in, an entire colony can be captured en masse.

The story of the bee tree goes back to a warm

day in June, 1944, when presumably a queen bee—overcrowded by her own fecundity and a mounting accumulation of honey and pollen stores—went forth from a man-made hive, probably somewhere in the nearby Bronx, in quest of space. No doubt she was accompanied by her older daughters, and some more young, for she would need help in establishing a new colony. They must have clustered for a time on a nearby limb, awaiting reports from scouts sent to reconnoiter; then they must have flown straight to a distant hollow located in the topmost section of a black oak tree. By coincidence, the oak tree happened to be growing on a woody ridge just east of Beaver Pond in the Zoological Park.

In early spring, 1945, there came a high wind which snapped off the hollow trunk some fifty feet from the ground and tossed it, loaded with comb and protesting bees, violently to earth. A large sliver of wood, torn from the face of the trunk as it fell, laid bare the occupied interior. It remained for a park policeman, searching the area for a lost child, to find the tree and report that he had discovered *hornets*.

But hornets are not plentiful in the spring . . .



About 9:30 o'clock in the evening all the bees were clustered on the comb and it was time to wrap netting over the aperture and prepare the trunk for travel. Just in front of the kneeling workman, the cardboard barrier across the lower end of the comb can be seen, securely wedged in with cotton.

not in New York. There was reason to be skeptical. Because hornets store no food to carry them through the winter, the entire colony perishes in the fall except for a lone queen mother, which survives by hibernating. Unlike bees, queen hornets must start from scratch each year without the aid of faithful daughters—and everyone knows it takes time to raise a family.

These were not hornets, but bees. There was no mistake about it. Their comb was made of wax, not paper. Great layers of it could plainly be seen through the wide gap in the hollow trunk stretched prone upon the ground. It was astonishing that the bees had managed to survive. Probably three weeks had elapsed since they were thrown from their lofty site in the old oak tree. Rains had come and flooded their combs, boys had tormented them with sticks and stones, yet they remained. Their tempers were somewhat aroused, but that was only to be expected.

When it became evident that the bees not only were holding their own, but actually increasing and making new comb, plans were laid for their capture. A section of the Reptile House lobby that backs up to a window leading out-of-doors

was chosen to receive the exhibit. Through this window it was intended the bees should go in search for food; but if they refused, provision was made for keeping them alive on sugar syrup rations. The enclosure itself is approximately 500 cubic feet in area, with a curved backdrop, painted sunshine yellow, a large observation window and at the side a glass service door. Over the lobby window is a large reflector bulb to entice the bees out-doors early in the morning.

On August 3 this novel display nook was in readiness. Three o'clock in the afternoon was set aside for reporters and photographers to record the unique process of preparing a bee tree for night removal. First it was trimmed to size with a two-man saw, cutting the wood at a point where auger soundings showed there were no bees. The section must not be longer than seven feet, since that was the height of the nook. Then the Curator of Insects, disguised in the comic headdress of all good beekeepers and wielding a belching bee smoker, cleared brush from about the hollow trunk and extracted sticks and stones from its humming interior. Minor cracks in the rear armor were plugged with cotton to eliminate

one bee escape route, and a cardboard partition was installed to seal the end of the hollow. The afternoon's work was completed when a long strip of gauze was tacked to the top edge of the gap, in readiness to be lowered at night when all the bees were at home.

The night meeting was arranged for nine o'clock, the earliest hour of darkness. It was indeed an auspicious occasion. Animal keepers were present, maintenance men with tools and truck, photographers and gentlemen of the press. There were even two men from the Bronx County Beekeepers' Association, and a local dentist who cancelled all evening engagements to enjoy the fun. A total of twelve persons was on hand, and as it turned out everyone was needed.

It was a good quarter-mile from the place in the woods back of Beaver Pond, where the bee tree was discovered, to the Reptile House, but the journey was accomplished without mishap and the tree carried into its prepared display nook. Not a person was stung. Not a bee was crushed.

The section was stood on end in a special well built in the floor to receive it. Jagged rocks, fungus-covered logs, dead leaves and other forest effects were strewn about to make a natural setting, to make it look as if the tree had grown in that position from a sapling.

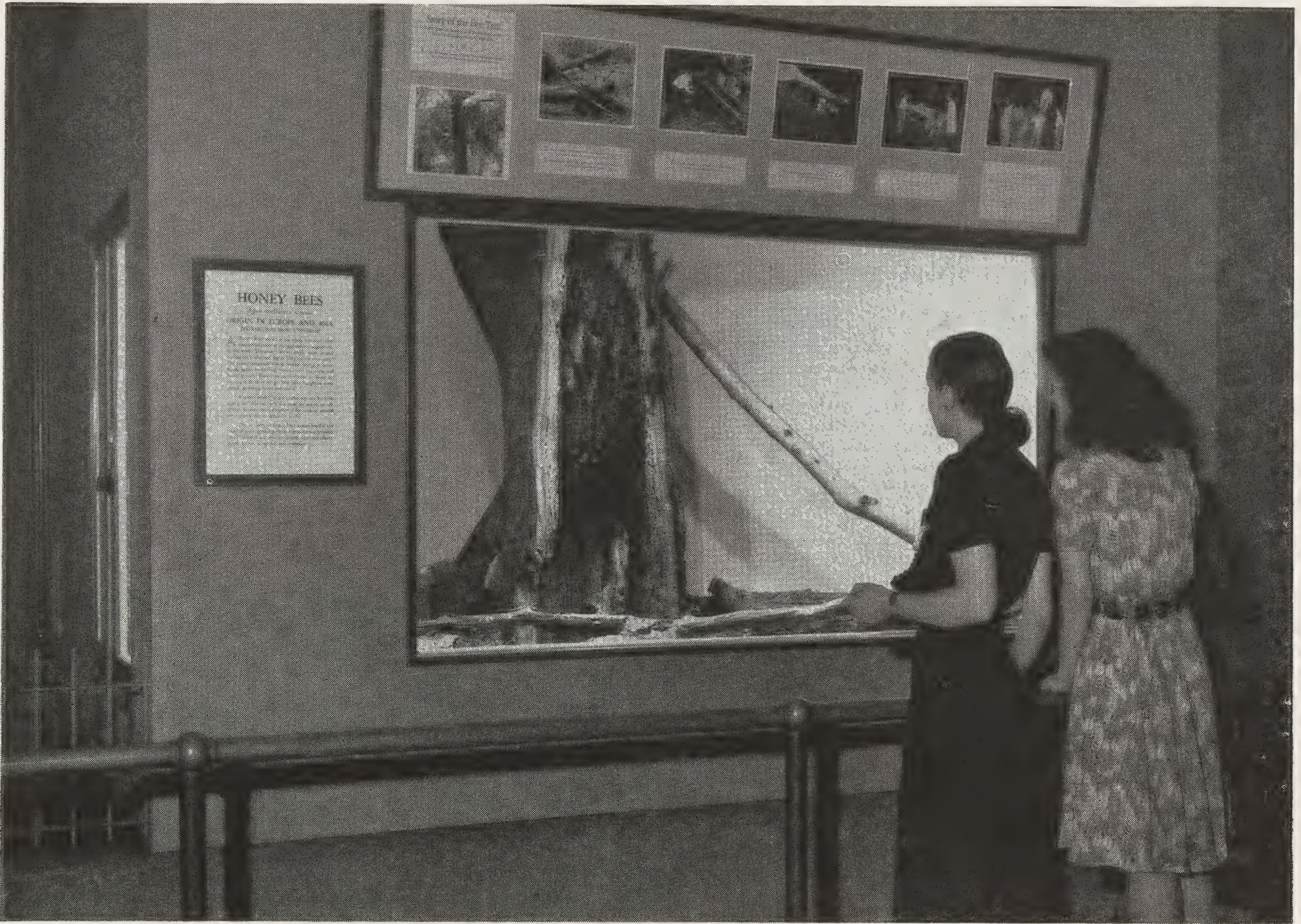
The time was close to midnight and most of the volunteer helpers had gone home. But there was still the tree to unseal. The bees were wildly flying against the gauze curtain, trying to escape, which did not lend charm to the prospect. They could be left imprisoned until morning but that would only postpone the hour of reckoning. Meanwhile their tempers would not be improved.

Then came the answer to the problem. Bees are attracted to light. By holding a floodlight so that it shone down through the window in the false ceiling, the gauze was removed from the face of the gap in perfect safety. A stream of bees flew up over the heads of the crouched workmen, but without so much as looking their way.

Now that the bees were released, it remained



The hardest part of the whole job was shifting the massive section of tree trunk into the waiting truck — and, later, lifting it into the enclosure in the Reptile House lobby. Rain had soaked the rotting wood and it weighed at least 500 pounds, far more than estimated. However, there were many helpers.



Now that the bee tree is in place in its exhibit enclosure, it has justified all the time and effort its preparation required. A spotlight plays on the comb and the activities of the bees are fully visible. Pictures overhead show steps in preparation of the exhibit, and labels tell the fascinating story of bees.

to make certain they would fly outdoors in the morning and not forget to come back again. The entire plan of the display nook was directed to that end. Once the exhibit was safely in, all windows were blacked out except the one at the rear through which it was intended the bees should escape. The spotlight over the window was to aid them in finding it and was to be turned on early to start action.

For the first week the public was allowed to glimpse the exhibit through peekholes that did not admit too much distracting light. But as the bees became accustomed to flying in a semi-circle to go outdoors, lured there by the outside daylight, the blinders on the display windows were gradually removed until at the end of two weeks the full scene could be revealed.

On August 18 the final touch to the exhibit was added. Until then, although the wide gap in the bee tree was plainly visible, the wax combs within and the cluster of bees were not. But now a baby spotlight throws a warm glow over

the area, revealing the geometrical design of the wax cells and the industry of the architects.

The story of the bee tree is told in pictures on the outside of the display nook, and there is a label which reads as follows:

HONEY BEES

Apis mellifera Linnaeus

ORIGIN IN EUROPE AND ASIA; DISTRIBUTION
NOW UNIVERSAL

A honeybee colony is essentially feminine. One queen-mother lays all the eggs and her daughters do all the work. The males (drones) simply mope around home waiting for a marriage flight. They cannot even sting! The young daughters remain indoors acting as nursemaids, ladies-in-waiting, construction engineers and honey storers. They even air-condition the home by fanning with their wings. The older daughters work outside gathering water, propolis and nectar.

A queen mother in full production can lay 3,000 eggs a day. She can even determine the sex of her offspring, laying female eggs in small cells and male eggs in larger ones. Worker-hood, however, is the result of arrested development due to a deficiency in diet.

The industry of honeybees makes fruitful our orchards and vegetable gardens. It provides wax to waterproof fabrics, to insulate electric wires, and to use in the manufacture of aeroplanes and cosmetics.

Another Great Plan for This Society's Future

By **DONALD T. CARLISLE**

Chairman, Membership Committee

"With the Zoological Society, this is a critical moment. The Executive Committee has been very heavily burdened, not only in planning for Park work, but in the difficult task of soliciting subscriptions for building operations. At this moment it needs the encouragement that the incoming of 2,000 new annual members would give. Leaving out of consideration the satisfaction which every public-spirited man feels in aiding a noble cause, will not the privileges of membership in the Zoological Society be worth to you and your family more than ten dollars per year? If you answer this question in the affirmative, please communicate with . . ."

APPROPRIATE as these words are at this moment in the Society's history, they are not the expression of a new need. They appear in the editorial of the fourth number of this magazine over the initials of Dr. William T. Hornaday, and they went forth to the Society's membership in the month of May, 1900.

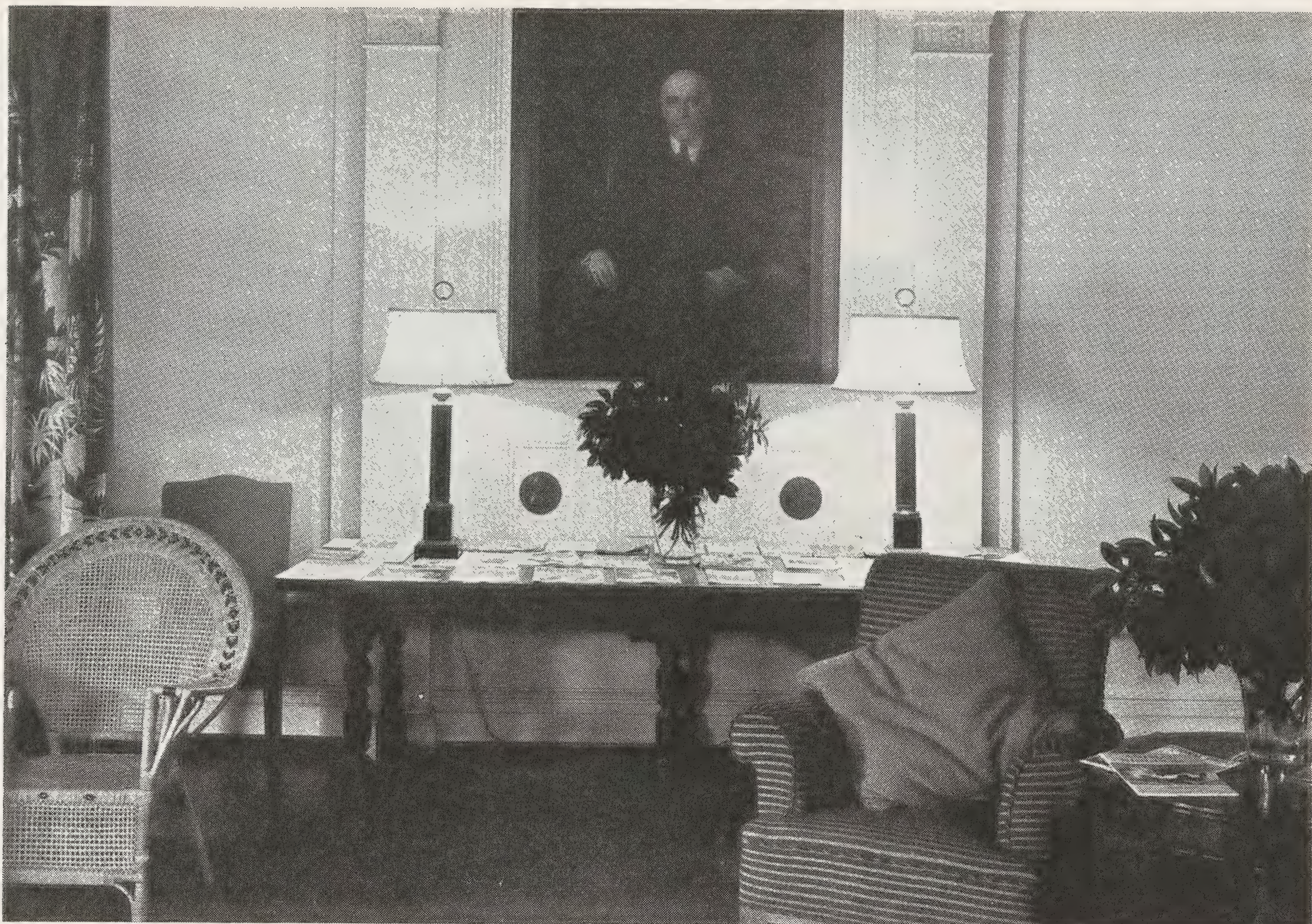
Back in that golden era familiarly known as the Gay Nineties, a small group of eminent New Yorkers went manfully to work to give expression to a great idea. They founded the New York Zoological Society, and in a relatively short time were able to open the gates of what was to become one of the world's greatest zoological parks.

The founding fathers perhaps built better than they knew. To begin with, they were granted

the use of some 240 acres of land ideally suited to their purpose. This tract, situated in the then remote Bronx Park development, held grassy pasture land, fine trees, rugged outcroppings of rock and ample water supply—all necessary to display effectively a truly representative collection of the world's fauna. Their second great asset was sufficient funds. Due to the generous benevolence of the men who founded the Society, and with the financial support of the City, it was possible in a matter of a very few years to erect, equip and stock the buildings forming the nucleus of the Park today. This loyalty of the early membership enabled the Zoological Society to put itself in a ranking position among such institutions in exceedingly short order.

Perhaps, the Society's greatest asset in those early days was the ideas on which it was based—for its founders saw the organization not merely as the operator of a "zoo", but as the trustee for several causes of great general importance. The Society was to contribute to zoological research, it was to aid in both general public as well as highly specialized education, and it was to lend its weight to the great cause of wild life conservation. All these purposes were close to the hearts and minds of the men who formed the Society and without them it is doubtful if the land and funds on which the Park grew would have been so rapidly forthcoming.

Time has brought its changes to the Zoological Park as it does to everything else. The great tract of land is here to be sure, improved, if anything, in beauty. The purposes of the Society remain the same, but if the work of this organization is not only to maintain the pace of the earlier years, but also to realize on the many new opportunities which lie ahead, we must revert to the plea which



In the Members' Room at the Zoological Park, comfortable armchairs and the latest zoological publications await our Members. Cool and restful in summer, warm and cozy in the autumn days with a fire crackling on the hearth, it is a welcome resting place for visiting Members of the Zoological Society.

was made so earnestly and so successfully forty-five years ago. We need the encouragement of many new members. It was only by means of a large and enthusiastic membership that the Society's founders were able to create this great foundation in record time. It will be by the same means that the Society will fit itself for its new era of social usefulness now at hand.

Again the Society's Executive Committee and the Staff have been busily engaged in planning for the future. Many projects await execution. The collections, maintained so successfully throughout the war years, must be replenished. The new techniques of exhibition with which we have been experimenting must be expanded to include many new species. Our buildings, most of them nearly half a century old, require renovation or remodelling to fit them for new purposes. New buildings must be created. Above all there are the needs for greater means with which to enable our talented staff to pursue the scientific investigations which give a leading purpose to the whole enterprise, and further

means must be found for expanding our great and growing educational and conservation activities.

This is a large work and an important one, for this Society must serve as a liaison between the great fields of biological science and the public or its true function will not have been performed.

Our Membership Campaign

In recent months we have sought new memberships. The response of present members to our appeals has been most gratifying. A number of members have been instrumental in bringing ten or more recruits to our ranks. In view of the fine program for the future, many former members who dropped out during the depression years are returning to the Society's rolls. Most pleasing to us however are the increasing memberships among young people, and the people from outside New York State whom we are welcoming almost daily. One new member out of every five lives far beyond the possibility of visiting us often.

Although membership has been increased by more than 40% since the first of the year, we are still far from the goal we seek.

We want at least to triple the membership of today, and it is to the interest of all present members to help us achieve this number. It takes only a simple arithmetical calculation to prove that the more members we have, the greater and better the privileges of membership become. We can hold more frequent membership meetings. Our publications can be increased in number and in value. Facilities reserved for members within the Park can be amplified.

It is our earnest desire to have our members visit us more often, become more familiar with what we are doing and what we plan to do. And in order that they will do so, we are hoping to be able to announce in the near future a number of things we plan to do for the comfort, convenience and interest of the membership.

This is not to be sure as "critical" a moment in the Society's history as was the spring of 1900 when Dr. Hornaday wrote the words with which this plea opens. Then means had to be found to make the Society's aims possible at all. Yet we do stand at a cross-roads today. Held up in progress by the necessities of war, we have been plotting our future course to fit us for becoming a truly greater new center of living natural history—not just a great Zoological Park or Aquarium, but an educational foundation and a laboratory. We cannot accomplish all we plan immediately, but the rate of our progress will relate definitely to the numbers and the enthusiasm of the Society's membership.

It is fitting again to quote the words which appeared in the Society's Magazine almost a half century ago:

"If you are already a member, pray send in the application of at least one other person."

New Members of the Zoological Society

Life

Mrs. G. B. Lambert

Annual

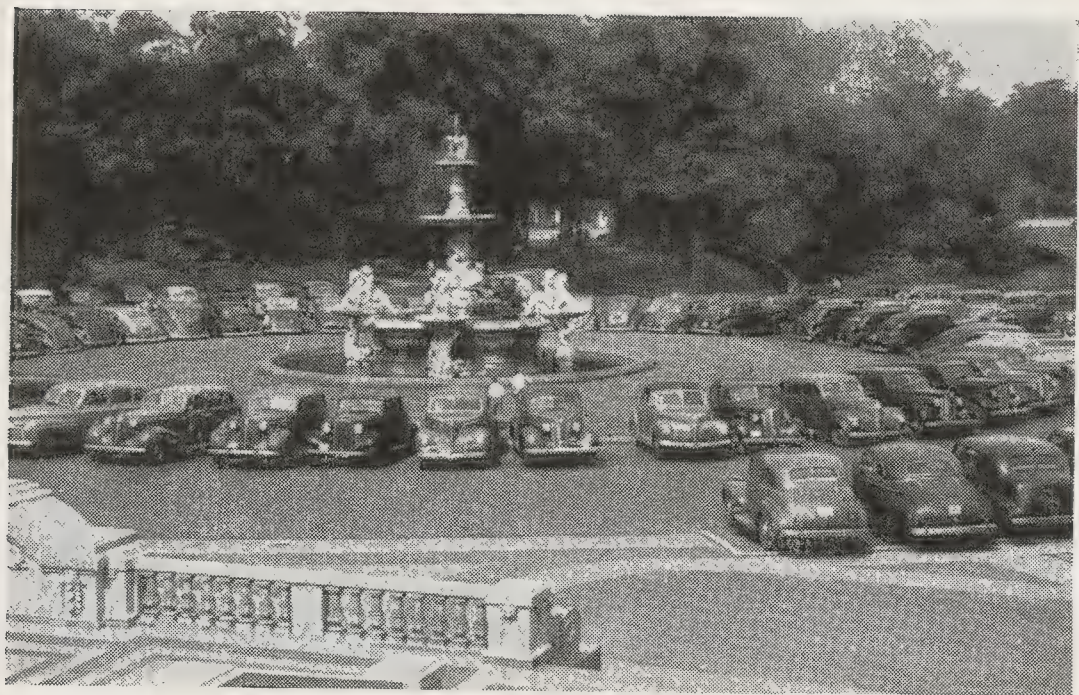
Ralph Arbus
Mrs. L. A. Atz
Robert E. Ball
Perkins Bass
Dr. F. L. Babbott
Dr. Catharine Bergen
Mrs. G. A. Berk
John Hartman Bittorf, (U.S.N.R.)
John C. Blick
Willard F. Boynton
Arthur P. Braaten
S. A. Christensen
Joseph M. Cudahy
Ernest B. Dane, Jr.

Clement L. Despard
Dr. Paul A. Eichorn
Alfred Ezra
Miss Agnes Fowler
Murray Friedman
Alfred Fritzsche
Mrs. Morgan Hamilton
Charles Hart
Mrs. Maxwell Hawkins
Bennett A. Johnson
Albert Koehl
Clara C. Lewis
J. Spedan Lewis
John Marshall
William D. McClure
George G. Moore, Jr.
Miss Margaret Osborn
A. E. Parsonnet, M. D.
E. Picket

Guido R. Rahr
Mrs. Mary B. Rogers
Walter G. Schneider
Thomas B. Scott, Jr.
Mrs. R. W. Sexton
Jesse Shanklin
Mrs. Louise Sherman
John L. Simon, M. D.
Mrs. C. F. Roe Slade
Mrs. Herman Dunlap Smith
E. W. Steiner
Charles Steinitz
Leo D. Sturgeon
Lawrence Tibbett
Emily Topp
E. S. Ward
Wildlife & Fish Dept.—
State of Louisiana
Richard S. Williams

ABOUT THE COVER ILLUSTRATION

The magnificent photograph of an Osprey descending to her nest, where a young bird is awaiting her arrival, is the work of Dr. Eliot Porter whose camera studies of birds are justly famous. This illustration is reproduced by the special permission of Dr. Porter.



Full house at the Fountain Circle parking field. This is one of three fields for automobiles.



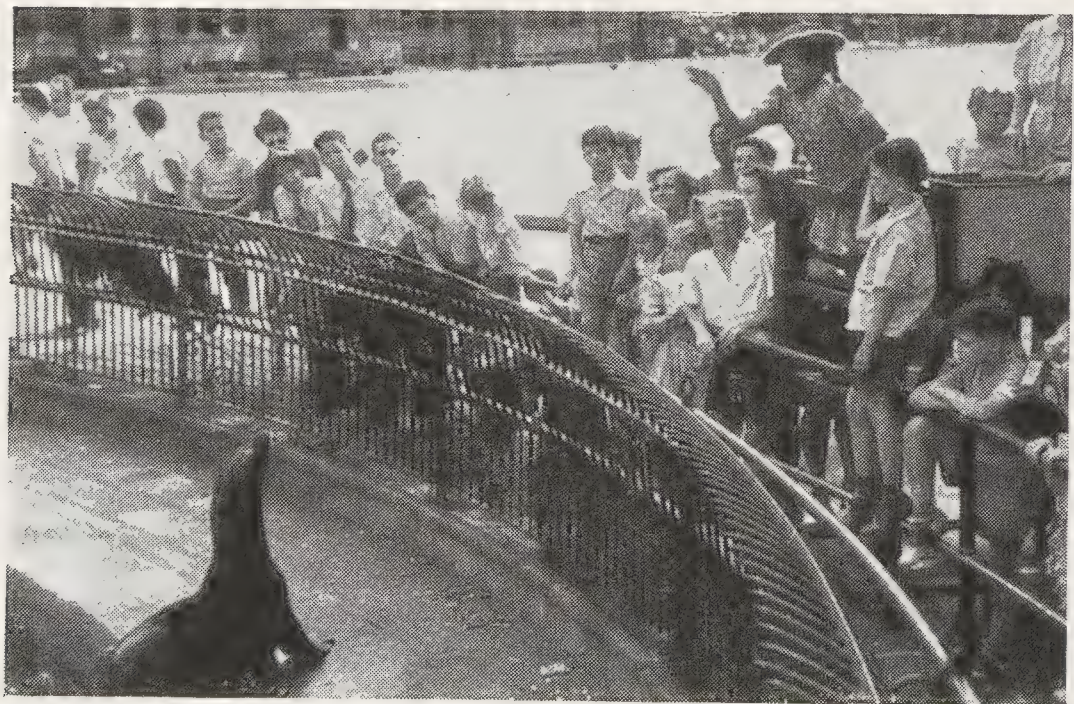
Tractor trains are in daily operation between the Fountain Circle and the Boston Road Gate.

"LET'S GO TO THE ZOO!"

Since that gray autumn afternoon in 1899 when the New York Zoological Park was formally dedicated, 96,010,834 persons (up to the end of this August), have obeyed the well-nigh universal impulse to look at strange animals — specifically, the strange animals in the Bronx Zoo.

They come to stare, to wonder, to relax and to learn. They come for all the reasons that any-

one can think of — and probably more besides. And they all have a good time in a variety of ways. The scenes on this and the two following pages are not meant to "prove" anything, or even to present a rounded picture of life in the Zoo on a typical summer Sunday afternoon. They're just a miscellany of people enjoying themselves — and animals having a good time, too!



People feed the animals, rules or no rules. So we sell smelts to be tossed to Sealions.



The best way to see the Zoo, if you are small, is to wheedle your Grandparents into a trip.



Interest in the stone Eagle from the old New York Postoffice is not always ornithological.



The younger generation is a thirsty generation, but there are plenty of watering places.



We inquired of this sailor, and learned that this was his first outing with his young son.



An instant later, the Children's Zoo goat began to chew — and things began to happen fast!



The Goldfish Bowl in the Children's Zoo was made for children, but parents can't resist.



It might be a woodland path, but actually it is the pony track in the heart of the Zoo.



The African Elephant puts out her trunk, and a crowd gathers to stuff it with crackerjack.



Every day except Monday the Haywagon Taxi plies between the Zoo and the Farm-in-the-Zoo.



Goats at the Farm-in-the-Zoo exercise a perpetual fascination for every human "kid."



Milking time at the Farm, and the visitors gather to watch the Farmer adjust the milker.



Causerie at the Penguin Pool — a familiar scene that visitors have photographed many times.



We like to think this earnest mother has absorbed our own enthusiasm for animal education.



Another proof that Grandparents are the best way to see the Zoo; reading the luncheon menu.



Slight accident — the baby Llama stepped on Mary's finger—and so Mary becomes a heroine.



If there is one scene more typical than another it is this — soldier, baby, mother, camera.



The appeal is the old one, of feeding the animals — they'll always know a Canada Goose.



When the Giant Pandas put on a show, a crowd gathers from nowhere seemingly in an instant.



The subway gate, and visitors are still pouring in for a healthy holiday visit to the Zoo.

We Carry the Society Into the Jungle

By WILLIAM BEEBE

THE Department of Tropical Research of the New York Zoological Society is concerned with scientific investigation, both in the Zoological Park and on expeditions to all parts of the world. The department cannot yet lay claim to a half century of activity, for the first trip was made only forty-five years ago, in August, 1900.¹

Since that date expeditions have averaged one each year. Geographically these have encircled the globe, including every continent and fifty-five degrees of latitude. Vertically they have extended from eighteen thousand feet above sea level in the Himalayas to a half mile beneath the surface of the ocean off Bermuda. Hundreds of living creatures have been collected and shipped back to our zoo, and more than seven hundred contributions have been published, of which nearly four hundred have appeared in the Society's publications, *ZOOLOGICA* and *ANIMAL KINGDOM*. For the past twenty-three years the results of the department's investigations have been presented at the Annual Meetings in the form of specimens, paintings and motion pictures.

As Mr. Osborn has mentioned in the present issue of *ANIMAL KINGDOM*, we have just returned from five months at Rancho Grande in Venezuela where a superb field laboratory has been established.²

It is too soon to present in detail the scientific and popular results, but there is one aspect of our work which is appropriate to this issue.

On page 123 Mr. Osborn has listed the four

Just back from our new Research Station in Venezuela, Dr. Beebe draws a parallel between the Society at home and in the field.

most important objects of the Zoological Society:

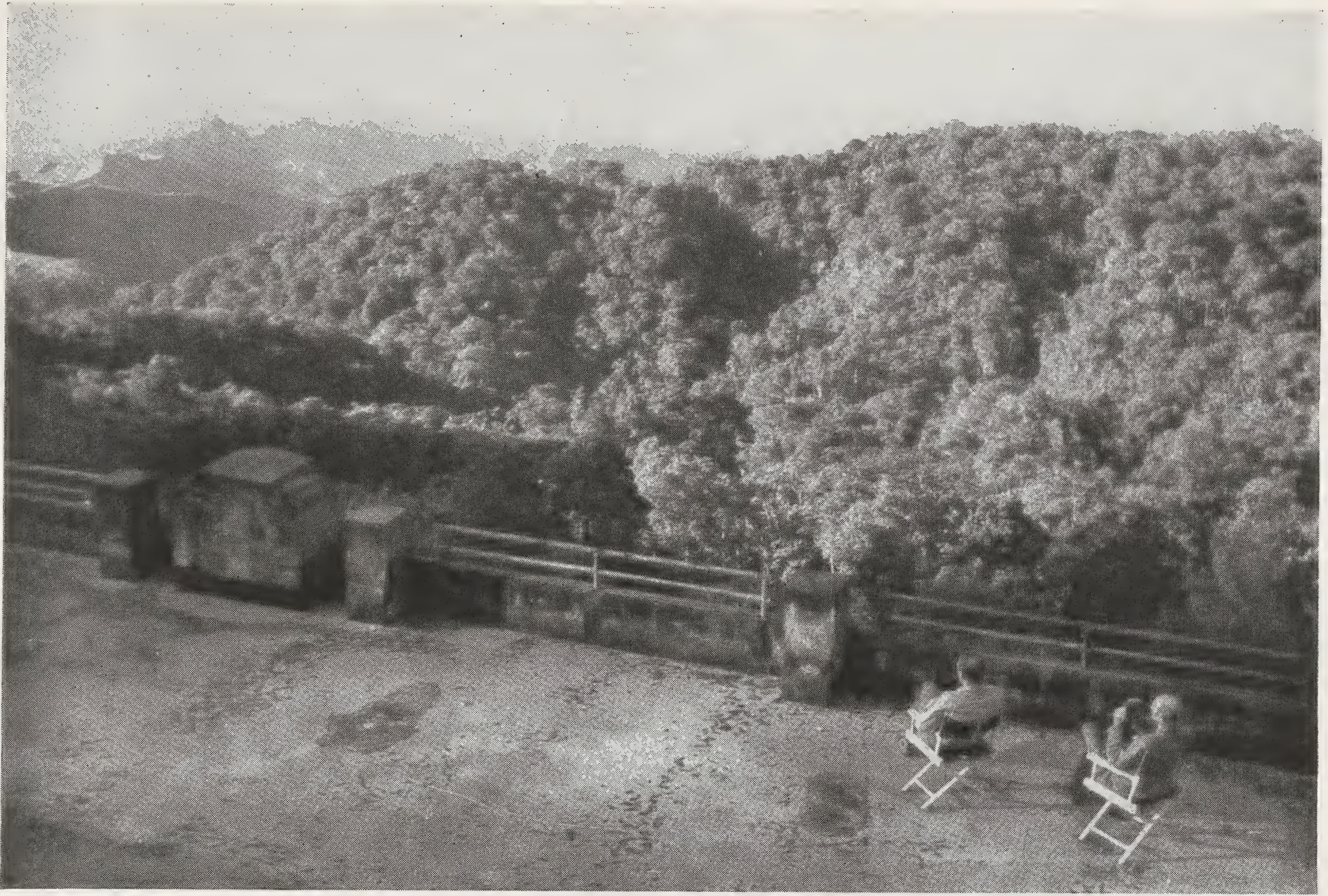
1. Management of public institutions designed to exhibit the animal life of this earth.
2. Popular education in zoology.
3. Scientific research.
4. Conservation of animal life and preservation of natural areas.

In our home laboratory in the heart of the Zoological Park in New York these objects are very real things, and their sustained development is evident every day both to the eye and to the ear. But what happens when our department packs up and transports itself bodily, both staff and elaborate outfit, thirty-five hundred miles to the south as the plane flies, coming to roost half a mile up in the heart of a magnificent, preserved cloud jungle? Do we temporarily shed Mr. Osborn's objects and evolve new ones, or what?

First, what about the management of public exhibits of living animals? Our concern in the zoo has always been with living creatures, and from our very first trip in the field our dominant interest has been rather with live organisms than great collections of dead ones. We crave privacy at our work so that our studies will not be interrupted, but in spite of this, when our vivaria and cages begin to fill up, word gets around and soon, from far and near, the vanguard of visitors appears and in courteous Spanish begs for a glimpse of the exciting reptiles, frogs and other

¹ For a general résumé of the department see Fairfield Osborn, "Scientific Odyssey," in *Animal Kingdom*, 1941, Vol. 44, No. 1.

² This expedition has received the generous support of the Venezuelan Government, the Creole Petroleum Corporation and the Standard Oil Company of New Jersey.



From the lofty, castellated roof of Rancho Grande, members of the Department of Tropical Research staff take one of their rare periods of rest and look out over a superb series of jungle-covered mountain ranges. Far in the distance, beyond the mountain ranges, they glimpse the blue water of Lake Valencia.

beasts in our collections. They know about these, for did not Manuel tell a cousin of his, who passed it on to an *amigo* of theirs, and here they are!

At the great half-finished, castle-like structure which is Rancho Grande we thought to be unusually free from these visitors, for less than an hour away by car is a very extensive zoo, with the pleasant name of Las Delicias, in which are contented lions, hippos, camels and other familiar animals, living happily with shade trees in place of heated buildings, and enjoying year-long sun and warm rains instead of ice and snow. But the Venezuelans seem more fond of their own native animal life, and as an important object of all our expeditions is to establish cordial relations with the people, one of us is always ready to play guide and host.

In the course of the past five months of this forty-fifth expedition we had hundreds of visitors, from the humblest ragged peon to high government officials and the archbishop of Caracas. The climax came at the official visit of one

hundred and fifty members of the International Agricultural Congress. We had already given addresses at their meetings in Caracas and shown our color movies. On their mass visit to us we were unprepared for the enthusiastic interest shown by these delegates whose homes ranged from Maine and Montana to Chili and Argentina. We had prepared a duplicate of the jungle show which we put on in the Bronx Zoo last year: poisonous and harmless jungle animals and plants, the most beautiful from orchids to ten-inch moon moths, the largest and the smallest and the sheer magic of color change, courtships and strange habits.

Many years ago in our northern zoo I trapped six mink which had depleted our flocks of geese and swans. In recent years wild carnivores have been less aggressive in the heart of New York City, but at Rancho Grande, so closely are we surrounded by primitive jungle that one night a jaguar broke down the door of a large cage and devoured or carried off a young aguti and a paca.

Closely connected with our jungle zoo comes

Mr. Osborn's second object, "Popular Education in Zoology," and this starts with our very first day. When the hunters and the road menders and a host of others learn our desires, wild creatures pour in, from eight-foot reptiles to tiny, exquisite and most rare insects. At first most of these are dead, and we have difficulty in demolishing widespread beliefs that every snake is very dangerous, *muy pica-pica!* After we demonstrate that most are harmless by letting them bite us, the number of incoming animals alive and in good health increases by about eighty per cent. We overhear our newly enlightened graduates of the college of truth proudly instructing their incredulous fellows, and so this and a score of other misconceptions begin to be dissipated.

Many of the native superstitions are so dramatic and striking that we are loath to discredit

them, as for example: Giant boa constrictors are known to drape themselves in the boughs overhanging jungle paths along which men are accustomed to pass. When the unsuspecting victim is directly beneath, the dangling serpent emits a great, hissing poisonous breath producing instant unconsciousness. The boa then descends slowly and at its leisure enjoys its horrid feast!

In many cases I suspect that our converts render only lip service and I am quite certain that some of the picturesque beliefs are still going full strength. There is another phase to this. When asked how I broke my leg on the second day of my arrival at Rancho Grande, I rather gloss over the fact that it was by way of a heavy ladder and a man falling on me. Our missionary efforts would be vitiated by any revelation of the ladder superstition held by so many of my fellow countrymen!



On the wing, the great Morpho butterflies of Rancho Grande can afford to flaunt their sapphire, opalescent blues. As they flutter and glide through the broken sunlight in the jungle, there are few creatures as beautiful. But when they fold their wings and alight, they dare show only dull, confusing camouflage.

Education of our assistants was sheer joy, so quick and skilful were they not only in discovering and collecting rare creatures, but learning at once how to house and feed them. At one time Miss Crane had eighty-five small jars filled with healthy jumping spiders. These required just the right amount of humidity and the right kind and size of living prey. Yet Pedro could always be depended on for a daily supply of the requisite number of fruit fles collected from heaven-knows-where. On other tables were luminous lizards (so-called), marsupial frogs, carnivorous katydids, and coral and other snakes and lizards with their eggs. We soon had a zoo in full swing, within sight of wild orchids and soaring harpy eagles, and within sound of howling monkeys and unequalled melodies of jungle wrens.

A splendid recent development of the Society's zoo is the introduction of backgrounds as natural as craftsmanship of artists and horticulturists will permit. In this respect we in the field amid tropical mountain forests are blessed of the gods. We can do little for the Zoological Park visitor except to strive to convey reality through photographs, paintings and words, in the hope that by the transmutation of imagination to imagination from one mind to another, by movies and two-dimensioned pigments and flat, black and white printed pages, we can accomplish one of two things: First, we can make the man who is forever city-bound by force of circumstance, after he has seen the great harlequin macaws in the zoo, go home and through the printed page continue to watch these birds beating across the high blue sky, two by two, like twin fragments of flying rainbows; then, following them to their nesting hole high up in a dead palm, watch them screeching affectionate nothings to their disheveled, reptile-like twin offspring. Secondly, we can perhaps irritate and annoy the urbanite who is just sheer lazy, phlegmatic and ignorant, into desire and will to see the world of tropical wild life before he dies.

Scientific Research, object number three of Mr. Osborn, is number one of ours in the field, for it is actually the *raison d'être* of the whole department. Throughout forty-five expeditions the heart of our activities is the laboratory, and the story of these will sometime be worth the

telling. One extreme was a transitory, one-night tent three and a half miles up among Tibetan mountains where we studied blood pheasants while outside a raging May blizzard battered the dwarf rhododendrons; others were the deserted gold-mine bungalow at Kartabo, and the converted saloon of a sumptuous yacht. Even the few cramped cubic feet in the sealed bathysphere swaying in the icy cold and blackness of under-sea may be included in this list.

Here at Rancho Grande, thanks to our Creole friends, we work in a perfectly appointed great room, fifteen by sixty feet, with three hundred square feet of glass filling one whole side. Our view is comparable to a scene in Switzerland, the giant trees in the foreground tower twice as high as those in a New England forest, the orchids in sight of the laboratory challenge any fabulous Babylonian hanging gardens, and the songs which come through the windows are as lovely as I have heard in the tropics.

Within this framework of beauty our Rancho Grande laboratory affords every practical facility. One day in late May I look down the long expanse of tiled room and at the farthest end see George Swanson working at his color plates under perfect lighting conditions. When possible he holds frog or snake or flower in one hand and paints with the other. Dangerous creatures pose behind glass. At this moment he is drawing a frog which, except that it has a head and four legs, might be an exquisite bit of moss. When put down on the table it does not hop, but creeps away, a progression reminiscent of distant salamandrine relations. Henry Fleming at the next table works with mind and fingers over piles of beautiful moths which came to windows or roof the preceding night, drawn irresistibly by the glare of electric lights. One evening in a gentle drizzle we counted more than seven thousand on the laboratory windows. As I write this, Fleming gives vent to the curious utterance with which an entomologist announces some unexpected find. He brings to my desk a dull, bedraggled insect which instantly assumes an aura of sanctity, for it is the first of its family ever to be taken in Venezuela.

A bitter ejaculation arises from Jocelyn Crane at her table, as she pores over a dish containing two small spiders. Her pencil, poised to record



Like knights of old, the giant armored, spear-headed beetles of the tropics wage fierce battles for the favors of the smaller females. Here conflict between two large males has reached its miniature fury.

some new elaborate routine of courtship, writes instead, "Unpremeditated murder." The passionate arachnid suitor omitted some ameliorating phase of his amorous advance, and this neglect of ancestrally dictated courtship denies him fatherhood of some dozens of spiderlings, and substitutes sudden death and the humiliating destiny of unintentional immolation at a pre-marriage feast for "the female of the species." My own concern for the moment is with three birds which dashed against the lighted windows. Two are giant swifts with stomachs crammed with several thousand flying ants of a species not found near Rancho Grande. The third bird is a white-throated rail which, according to ornithological literature, should not occur nearer than the Pacific slope of Peru.

And so throughout our expeditions, we pile up fragments of knowledge, scientific details which, unimportant in themselves, will sooner or later fit into their place in some ultimate satisfying philosophy.

The last object of the Zoological Society listed on page 123 is Conservation of Animal Life and Preservation of Natural Areas. As true naturalists we cannot help being vitally interested in this theme, although many of our trips have been

to places uninhabited and as yet unspoiled by man.

At Rancho Grande conservation holds a foremost place in our thoughts for several very good reasons. First, we are working in the heart of the National Park of Venezuela, where wild life is protected by law and in addition by the steepness of the slopes, which latter is a most efficient deterrent to poaching. Elsewhere I shall tell of the very apparent results of nine years of protection.

A wholly different aspect induced by the same abrupt declivities is the continual danger of landslides. Day after day in the rains we find our cement highway blocked by some great tree or piles of rocks and earth, all of which are quickly removed by hard working government road gangs. Even our own Rancho is not immune and scores of Australian casuarina trees, quick growing and with earth-gripping roots, are planted on all sides of our jungle castle. A floor in the rear of the building has buckled under pressure from the jungle, and we have received word of a still more recent shift. Visitors occasionally look down at the distant Lake Valencia and, with questionable humor, prophesy a future swift descent of Rancho, together

with laboratory and staff, to the lake. I can only counter with the remark that limnology has always held considerable interest for us.

So, in our case, Conservation, with a capital C, combines, with our wish to preserve the wild life about us, a very personal interest!

Reviewing the four objects listed by Fairfield Osborn, we realize that no matter to what great distances our expeditions take us, or how isolated our field activities, we still have the same bonds which knit us so closely to our Mother Society in New York.

In New York we now have a Question House where visitors ask and we try to answer. Elsewhere I always feel quite helpless when I sit between John Kieran and Frank Adams at "In-

formation Please" and strive to search my soul for right answers. Never, however, does a human being, a naturalist, feel more ignorant and humble than in a jungle like that at Rancho Grande. This indeed is the world's original Question House where birds and beasts and insects themselves propound vital interrogations with every form, pattern, color, voice and action, and our poor brains grope for even the shadow of an answer. We come to think of all our fellow jungle beings as forming a Children's Zoo, while we onlookers, no matter how many degrees we boast, in spite of a more than half century of study, ourselves are children at this game. But whether we win or lose, it is the grandest game in the world.



The pets of the Department of Tropical Research always include a tame monkey, preferably the intelligent Capuchin, former slave of the itinerant organ-grinders. When the staff "pays him out" up a tree to get nuts, its only hope of success is to haul in the leash quickly and empty "Cappy's" cheek pouches.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

We Aid the San Francisco Zoo in Planning Development

By JOHN TEE-VAN

The staff of the Zoological Society was much pleased after the February visit to the Zoological Park of Mr. Lloyd E. Wilson, President of the Park Commission of the City of San Francisco, to receive a request asking if one of our staff members could come to San Francisco and review the San Francisco Zoological Garden with the idea of suggesting post-war changes and improvements in methods of operation. As a result I spent two and a half weeks during August in intensive observation of the Garden, and a report covering the results of the visit to San Francisco will be submitted to the Park Commission of that city in the near future.

San Francisco's Zoological Garden, although started in 1929 and thus a relative newcomer to the ranks of first-class zoos, stands high in accomplishment and interest. The Park, approximately 60 acres in extent, not all of which is developed, is situated in the southwest portion of the City, close to the ocean and in intimate contact with the rest of the City and nearby counties through wide and extensive parkways and motor roads.

During the years 1936 to 1940 the so-called new section of the San Francisco Zoo was completed under the supervision of the Federal Government. Within its confines is a large building for the big cats, on the south and west sides of which Lions and Tigers enjoy extensive moated enclosures; a large "Pachyderm" building for Elephants, Hippopotamus, Tapirs and Rhinoceroses; goose and duck ponds plus a series of excellent moated bear grottos, in one of which four young Grizzly Bears with their mother formed an unceasing source of amusement and merriment for large numbers of visitors. Completing this area is an exhibit devoted to Sea-lions where special shows of these active animals are given twice daily, and a large outdoor aquatic bird cage connected by an enormous open circu-

lar window with an interesting building that enables the public to observe through glass the birds that enter the inner exhibition quarters. The remaining older part of the Park is devoted to simple cages housing collections of birds, monkeys (including excellent Chimpanzees and Gibbons), Lions, Tigers, Pumas, Leopards and other cats, Giraffes, Camels, Zebras, Wallabies, Kangaroos, etc.

To those of us who have been operating parks during the war years and thus have a realization of the difficulties of securing sufficient and adequate help to do the necessary work, the maintenance of the San Francisco Zoo is astonishingly good. Walks, grounds, animal enclosures and little-seen service quarters were immaculately kept. The Director, Carey Baldwin, and the staff of the Garden deserve a great deal of commendation for their excellent work.

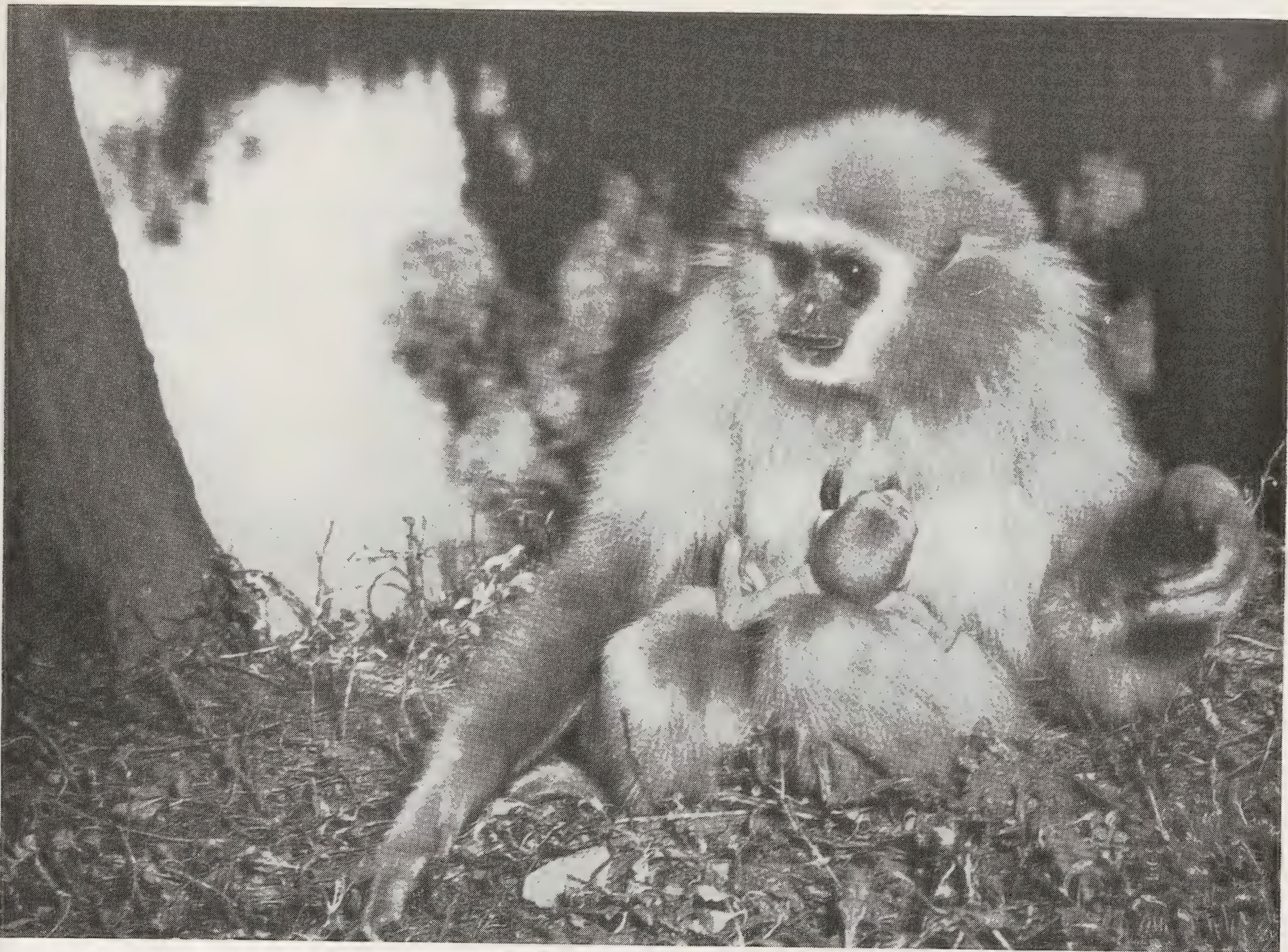
The future of the San Francisco Zoological Garden should be an exceedingly bright one. It starts off with a goodly proportion of its grounds well developed and in keeping with modern ideas of how animals should be displayed. It has sufficient space within which to expand; its closeness to a great port means that it can easily draw upon a large part of the world for its animals. Finally, it is served by a small but devoted and vigorous group of men who wish to see the Zoo completed and its services to the public increased.

Our First Baby Gibbon Is Born And Seems to Be Doing Well

By LEE S. CRANDALL

Gibbons are comparatively rare captives at any time, but since the last importation was made, in 1941, none whatever have been available. Consequently, when two White-handed Gibbons (*Hylobates lar*) were received, in September, 1942, from Mr. Hayden B. Harris, they were a welcome pair, indeed.

White-handed Gibbons are usually black in



Two hours of coaxing went into the making of this picture of the White-handed Gibbon and her baby, taken three days after the birth of the baby. Before the birth, the mother showed very little timidity and willingly approached her keeper and photographers. Finally a bunch of grapes lured her down.

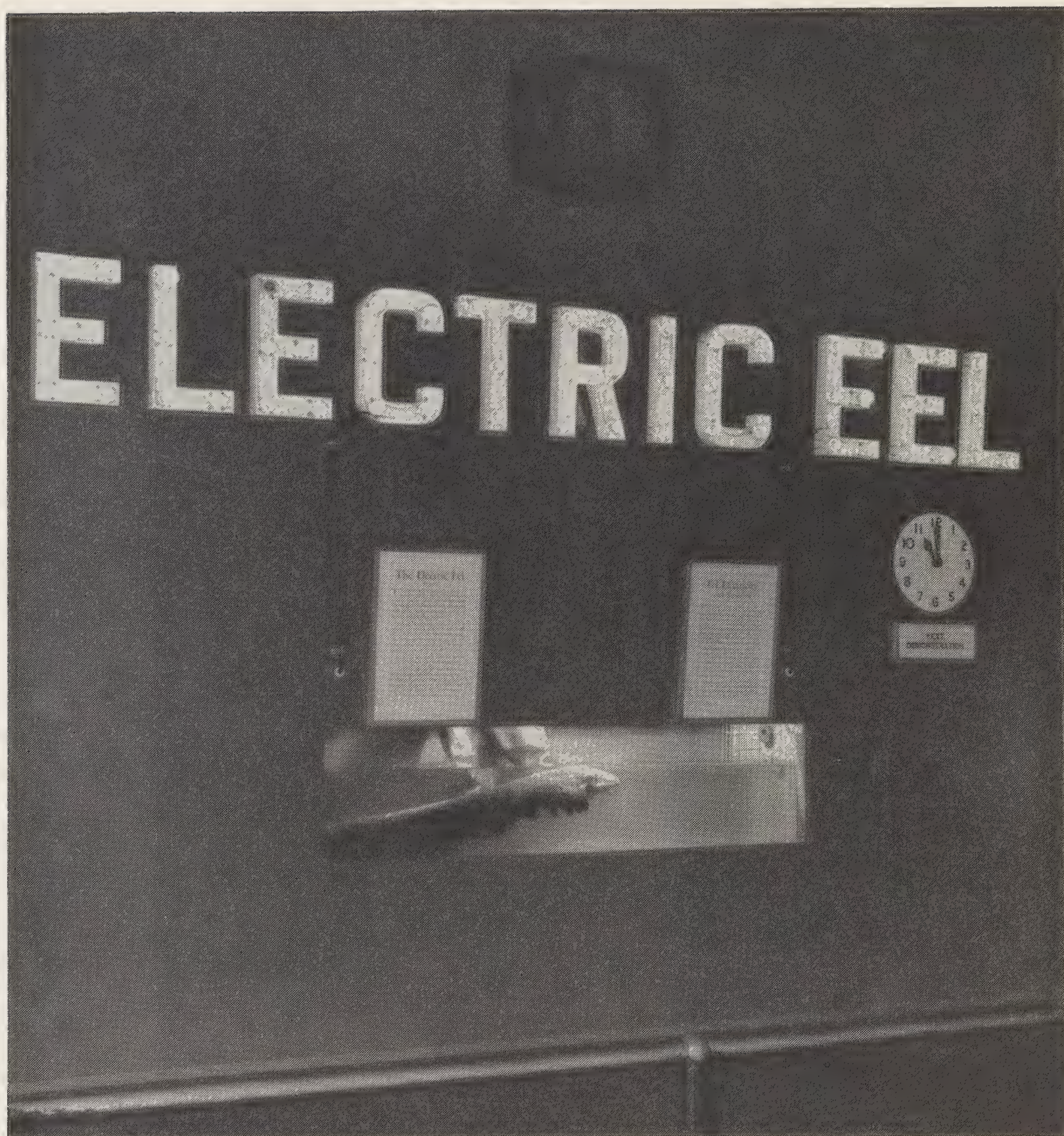
color, with white hands, feet, forehead and whiskers. Both of our animals, however, are a soft *café au lait*, a variation occurring frequently in the wild state.

During their first summer here, the new Gibbons lived in the wilds of Gibbon Island in peaceful companionship with a number of Spider Monkeys. Very soon, however, the Spiders learned that they could wade ashore through the two-foot depth and did so with enthusiasm, each carefully using one hand to hold the tip of its tail above water. So, for the past two summers, the Gibbons have had the Island to themselves. Winters have been passed in a large compartment in the Plains Lion House, where warmth, light and space for exercise were ample. Late in May of this year, when the Gibbons were being transferred to a shift-cage for their annual trip to the Island, there was some conjecture as to a possible increase in the family. After liberation, there was little opportunity for close observation,

as the female, always a little more shy than her mate, usually remained high in the trees at feeding time.

We must confess, therefore, that we were almost completely surprised when, on the morning of September 10, keepers reported that a baby Gibbon had been born. There was a rush, of course, for Gibbon Island. Gathered on the rocks of the view area, we strained our eyes toward the tree-tops. Eventually, all had a fleeting view of the tiny body, wrapped tightly about its mother's middle. Later, the infant was seen to move upward and then to nurse.

Gibbons have been bred, rarely, before. But this is our first-born and the situation, we believe, is favorable. The parents are in perfect condition, living happily in almost complete freedom. When the approach of cold weather makes necessary their removal to winter quarters, the youngster should be well established as one of the family circle.



Newest exhibit in the Aquarium is this working display of the electrical powers of the Electric Eel. At hourly intervals through the week, half-hourly on week - ends, attendants thrust rubber-gloved hands into the Eel's tank and disturb the fish, whereupon it sends out a series of discharges. These cause a loudspeaker above the tank to crackle, as with static, and then the flip of a switch sends the current into the electric lights in the panel, spelling out the words ELECTRIC EEL.

PUBLICATIONS OF INTEREST

NATIVE PEOPLES OF THE PACIFIC WORLD. By Felix M. Keesing. 144 pp., 71 illus. The Macmillan Company, New York, 1945. \$3.00.

Now, when the problems of peace are upon us and it is increasingly important to understand the peoples of the Pacific world and their relations to each other and to us, it is most timely that "Native Peoples of the Pacific World" has appeared. It is the second of the supplementary volumes on the natural history and peoples of the Pacific that were designed to follow the introductory book, "The Pacific World," published last year under the auspices of the American Committee for International Wild Life Protection and under the editorship of Fairfield Osborn. The first supplement, "Mammals of the Pacific World," was published this spring.

Dr. Keesing is Professor of Anthropology at Stanford University and a recognized authority on the peoples of the Pacific. Indeed, he was called upon by the Government to train military

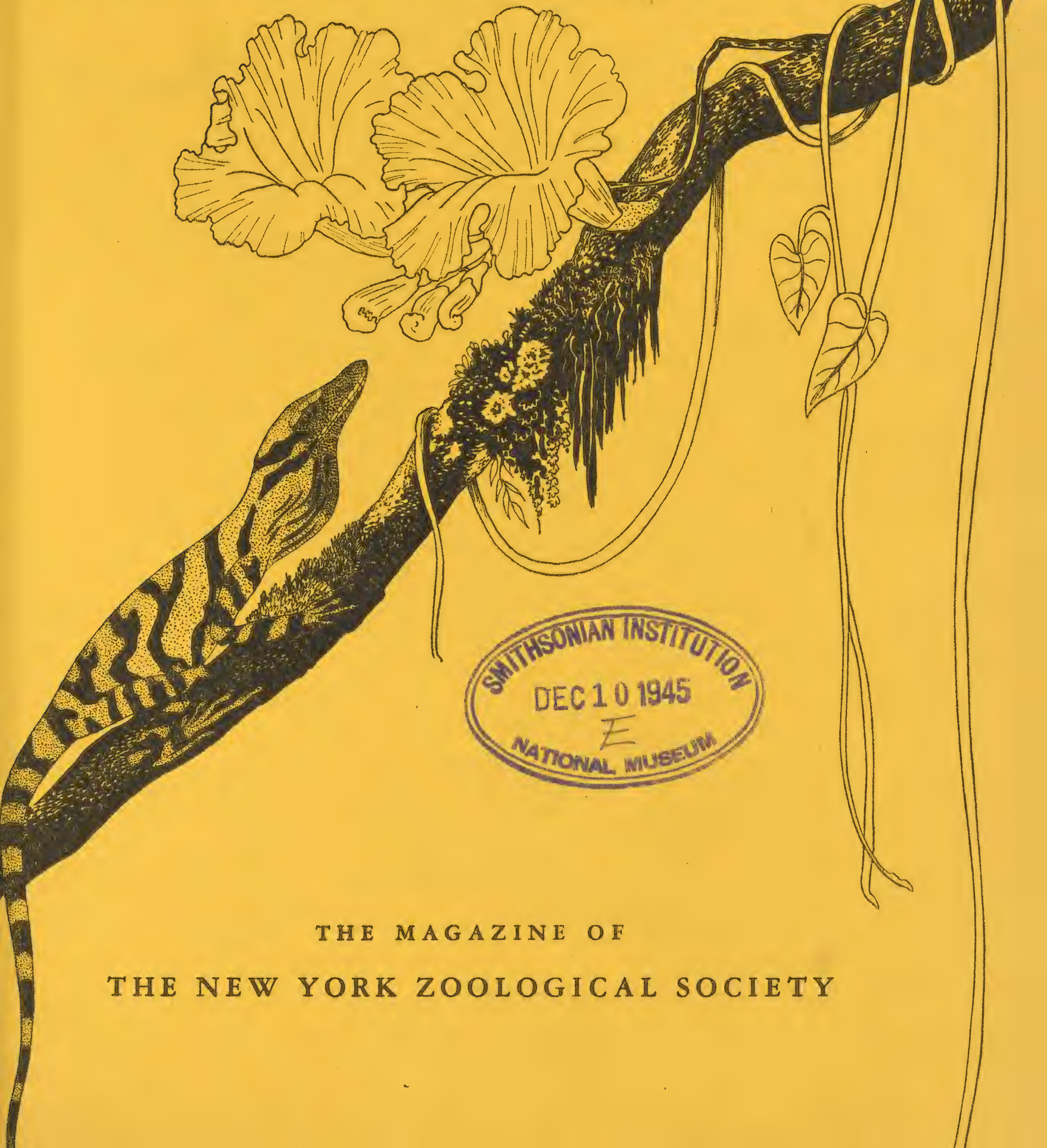
personnel for service among the islands, and this book is an outgrowth of his very practical work with the Armed Services.

His point of view, as he discusses the physical groups of peoples, their languages, government, means of obtaining a livelihood, home conditions, social customs and religions, is emphasized both by implication and directly: "... the islanders are thoroughly human people. They have the same general needs and interests, the same problems and anxieties, as the man of New York or London."

It is too likely to be our naive belief that peoples who do not possess the blessings of electricity, indoor plumbing and plastics are not only benighted but miserable in their benightedness. Dr. Keesing makes it quite clear that in most of the affairs of daily life, there is little we of the mechanical civilizations can contribute to their lives: "In some respects the island peoples have already worked out about as good solutions as can be found for getting along satisfactorily in their island homes."

540.613
A59

ANIMAL KINGDOM



THE MAGAZINE OF
THE NEW YORK ZOOLOGICAL SOCIETY

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York 20, N. Y.

PRESIDENT

Fairfield Osborn

FIRST VICE-PRESIDENT

Alfred Ely

SECOND VICE-PRESIDENT

Laurance S. Rockefeller

SECRETARY

Harold J. O'Connell

TREASURER

Cornelius R. Agnew

EXECUTIVE COMMITTEE

Fairfield Osborn, *Chairman*

Cornelius R. Agnew
Alfred Ely
De Forest Grant

Warren Kinney
William De Forest Manice

David H. McAlpin
Robert Moses

Harold J. O'Connell
Laurance S. Rockefeller
J. Watson Webb

BOARD OF TRUSTEES

Class of 1946

George Gordon Battle
George C. Clark
F. Trubee Davison

Jay Downer
Robert I. Gannon

Robert Gordon McKay
Fairfield Osborn

Laurance S. Rockefeller
John M. Schiff
Frederic C. Walcott

Class of 1947

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez

De Forest Grant
Eugene Holman
Warren Kinney

Henry R. Luce
William De Forest Manice
Harold J. O'Connell

Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1948

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely

Marshall Field
Childs Frick
Archer M. Huntington

David H. McAlpin
John H. H. Phipps

Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Ex-officio, The City of New York

The Mayor, Hon. Fiorello H. LaGuardia

Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

John Tee-Van *Executive Secretary*

Jean Delacour *Technical Adviser*

Sam Dunton *Photographer*

William Bridges *Editor & Curator, Publications*

Edward Kearney *Manager, Facilities Dept.*

Sanford Miles *Comptroller*

Quentin Melling Schubert, *Superintendent, Construction and Maintenance*

ZOOLOGICAL PARK

Lee S. Crandall . *General Curator & Curator of Birds*

Leonard J. Goss *Veterinarian*

Brayton Eddy *Curator of Insects & Acting Curator of Reptiles*

Myrtice A. Blatchley *Associate, Department of Education*

Grace Davall *Assistant to General Curator*

W. Reid Blair *Director Emeritus*

William Beebe *Honorary Curator, Birds*

AQUARIUM

Christopher W. Coates *Curator and Aquarist*

C. M. Breder, Jr. . *Research Associate in Ichthyology*

Ross F. Nigrelli *Pathologist*

George M. Smith . *Research Associate in Pathology*

Myron Gordon *Assistant Curator*

Homer W. Smith . *Research Associate in Physiology*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*

Jocelyn Crane *Research Zoologist*

Henry Fleming *Entomologist*

George Swanson *Staff Artist*

Associates

William K. Gregory
John Tee-Van

Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

VOL. XLVIII

DECEMBER 6, 1945

No. 6

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York 20, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York 60, N. Y. Title registered with United States Patent Office.

Subscription, \$1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

We Must Reverse the Tide

The tide is still running out. Forests are being depleted, soils and water sources are deteriorating. This is true not only in the United States but in many other parts of the world. If these primary natural resources continue to disappear, the gains that have been made in wildlife preservation will be forfeited. As for man himself, his world will become to an increasing degree a world of want.

How can such conditions be explained? Principally because there is no general understanding of the complete interdependence of plant life, animal life, water supply and soils. Great advances in knowledge concerning this complex subject have been made. A new science, known as Conservation, has come into existence.

The cure for the present critical situation must come through basic education and informed public opinion. As to basic education, the principles of Conservation should be integrated into the general curricula of our schools and colleges and not isolated as a "special course." The teaching of history would be illuminated by analyzing to what extent the exhaustion of living resources contributed to the fall of civilizations and to wars between nations. Courses in chemistry and engineering would be vitalized were they oriented to the needs of effective management of Nature's resources. By the same token, courses in biology would become far more purposeful if they provided a better understanding of the interrelationship of all living things.

As to informed public opinion, the novel Wyoming project, described elsewhere in this issue, will, we believe, in addition to its great recreational values, contribute substantially to popular understanding of wildlife management and to the preservation of natural areas.

Conservation is no longer a "side show"—it is the "big tent" of human existence.

Fairfield Osborn

IN THIS ISSUE

Jungle Still-life	George Alan Swanson	COVER
Family Affairs on Gibbon Island	Lee S. Crandall	165
The Zoological Society Is Going to Wyoming	Fairfield Osborn	168
Jungle Studio	George Alan Swanson	170
Insects in Winter	Brayton Eddy	176
A Swellfish Story	Myron Gordon	182
Behind the Scenes: News and Notes		187
You Can Make Christmas Last All Year		191
Index to Vol. XLVIII		193



The White-handed Gibbons
Come Down for a Drink

This striking picture was taken on Gibb
Island by Lilo Hess and illustrates how G
bons generally drink in the wild—by dipp
water or sweeping hands through wet leav

Family Affairs on Gibbon Island

By LEE S. CRANDALL

SINCE THE BRIEF and somewhat breathless announcement in *ANIMAL KINGDOM* for September-October, 1945, that a baby White-handed Gibbon had been born on September 10, enough time has passed to permit a calmer and perhaps more coherent report. While it is true that Gibbons have been born and reared in captivity on several occasions, a birth is still a rare event. Moreover, we have never yet succeeded in rearing any anthropoid ape, perhaps because our installations, designed primarily for exhibition, are not always suited for breeding. Perhaps that is why we now are uncommonly eager for success.

Actually, no part of this cycle was completed in a confined exhibition area. Received at the Zoological Park in September, 1942, as the gift of Mr. Hayden B. Harris, the prospective parents were placed at once in a large spare cage at the African Plains Lion House. This building, while both warm and light, is not open to the public. Here the animals have the utmost seclusion during the winter months. Summers have been passed in the complete freedom of Gibbon Island, where the Gibbons' wonderful flying leaps from tree to tree can be readily viewed but where an expanse of approximately forty feet of the intervening waters of Lake Agassiz must give the animals a feeling of security. Not that they seemed to be in especial need of such protection, for through it all they have remained completely tame and docile. But no animal breeds in confinement unless all its needs are satisfied.

During the first summer or two, the Gibbons shared the island with a varied assortment of Spider Monkeys, with which they got on very well. However, drifting silt gradually raised the floor of the lake separating the island from the viewing area and the monkeys eventually found themselves able to wade ashore through water hardly two feet deep. It was amusing to see

Life in the treetops was full of harmony until Baby arrived—but now we must deal with a bad case of paternal jealousy.

them inch gingerly along, clinging firmly with one hand to upraised tail. But it was definitely not amusing for a corps of Keepers to have to pursue them in and around parked cars and among troops of delighted visitors. So, as each monkey came ashore, its days of freedom ended; when the last one made the trip, the Gibbons had the island to themselves. For Gibbons, like other anthropoids, are not only unable to swim but are very careful not to place themselves in a position where they might have to try. Gibbons walk upright naturally and well, and ours could come ashore easily, but this they are unlikely ever to learn.

Ideal as the sylvan retreat of the island would seem for courtship, the actual mating must have taken place, unobserved, in the seclusion of winter quarters. Soon after the middle of May, 1945, when the temperature had risen sufficiently and foliage was enough advanced to provide needed protection, the Gibbons were removed to the island. The female seemed unusually plump and some mild speculations were made though we had no real confidence that they would materialize. Throughout the long summer, the Gibbons continued happy and active, amazing our visitors with their aerial agility and otherwise comporting themselves quite normally.

On September 10, then, there was intense excitement when Keeper Reilley reported that the female Gibbon appeared to be carrying a baby. Summoning such members of the staff as were within shouting distance, we rushed out to the viewing area. A few minutes' observation showed it to be true indeed: a tiny object was resting

*Lilo Hess Photo*

By the time the baby Gibbon was three weeks old, it had begun to take a real interest in the world around it, and especially in the friendly people who approached its mother and induced her to swing down from the trees to the ground. Earlier the baby had seemed to pay little attention to visitors on the island.

crosswise, low on the mother's abdomen, supported by her sharply flexed thighs.

Not knowing how the mother would react to closer investigation, we withdrew for the time,

marveling at our good fortune. True, we could add nothing to our knowledge of the gestation period, which has been variously reported as seven and nine months. But it was a passing

regret, for more than all else we wanted to rear the baby. Later, we found that parenthood had had no effect on the charming gentleness our Gibbons have always exhibited and that the infant could be observed and even photographed without upsetting them in the least.

Both parents are of the golden brown, coffee-and-cream color phase sometimes found in the White-handed Gibbon. The white hands, feet and facial fringe are present, although, of course, not so sharply contrasted as in the more common black-bodied form. The infant showed, at birth, that it meant to follow the pattern of its parents, for its crown was well thatched with golden hair, with a scraggly mantle across its shoulders. Otherwise, it was quite naked, and the wrinkled skin of its tiny body and unbelievably attenuated arms was grayish-black.

On the day after its birth, the infant was seen to move upward, seek its mother's breast and nurse. Thereafter, it retained the upright position, its legs nearly encircling the mother's waist, while its arms clasped her firmly around the chest just below the armpits. While both fists and feet stoutly entwined themselves in the hair of the mother's luxurious coat, one has the impression that the pressure of the tiny limbs against the mother's body is a definite factor in maintaining the infant's position.

As September drew to a close, hasty plans were made for winter quarters. It was obvious that a family group of such interest must be made available to our visitors, if this were possible. Yet we had no means of knowing how the Gibbons would react, as they had never been fully exposed to close public view. Moreover, with breeding Gibbons in other collections, uniformly successful results had not been indicated. So, with some misgivings, we set about the preparation of a large cage in the unused northwestern section of the Primate House, behind a pressed-wood front with glassed viewing space.

When all was complete, even to explanatory labels, the Gibbons were coaxed into a shifting box and transferred to their new home. It was high time, for the date was October 6 and rapidly falling leaves indicated the near approach of cold weather.

Once they were installed, our fears for the Gibbons' behavior were quickly stilled. They might, themselves, have been born in this cage,

so soon were they at home. Far from being upset by staring eyes, they came to the front and stared back, with interest.

By now, the infant's growth was plainly evident. The thin mantle of hair across its shoulders had crept downward, until its back was covered with golden down. This extended, on the limbs, to knees and elbows, on the outer surfaces, the remainder of the body being quite bare. While it still clung tightly to its mother, its interest in the world outside its furry haven was growing and in moments when its mother's attention was diverted by food or other matters, a tiny, tenuous arm and hand might be seen groping about for whatever might be within reach. Occasionally, the slender fingers would close on some small object which the mother, apparently unobservant, would instantly remove.

During the first week indoors, the father's conduct was exemplary. He displayed great interest in the infant, gazing at it fondly and even touching it gently. After the novelty had subsided, however, his activities took another tack. He wanted some attention for himself and his efforts to force his mate were, at first, both ludicrous and amusing. He would lie on his back, gently prodding her with his feet. She would endure it for a bit, then move away. When he snuggled up to her, presenting one shoulder, then the other, for much desired scratching, she remained indifferent. When he scratched it himself, to show what was wanted, she allowed her gaze to wander elsewhere. Then began a phase of increased fatherly interest in the infant, leading up to repeated attempts to touch it. Each time, when the extended hand touched the tiny body, the mother's hand was there to push his gently aside. Day by day, the father's evident jealousy and the mother's obvious anxiety grew. On October 21 the climax came when an observant Keeper intervened to interrupt the first real squabble, resulting from an apparently determined effort, on the part of the father, to drag the infant from its mother's embrace. He has languished since, in the confines of the shift cage, pathetically but safely barred from more than visual contact with his offspring. No doubt we shall relent, sooner or later, but any visits will definitely be made under surveillance. We are proud of our Gibbons, individually and as a family, but we mean to rear that baby.

The Zoological Society Is Going to Wyoming

By **FAIRFIELD OSBORN**
*President of the New York
Zoological Society*

A GREAT PROJECT is in the making in which it falls to the happy lot of the Zoological Society to take an active leadership. Work is to be commenced next Spring, as soon as the frost leaves the ground, on the creation of a wildlife and conservation project in the beautiful high Wyoming valley known as Jackson Hole, bordered on the west by the majestic Tetons. In the words of Governor Hunt of Wyoming, in a statement issued by him on November 1, this plan provides for "the perpetuation of the State as a gathering point for naturalists and wildlife enthusiasts and an area for scientific study in wildlife conservation, propagation and management on a scale unparalleled in the nation."

We do not believe that the Governor has overstated the case. Our feeling is that the long-range possibilities are indeed very great and that the phrase "unparalleled in the nation" may come to be truly applied. Much depends upon the resourcefulness and vision of our institution in developing the program.

The first step provides for the creation of what may be described as a great game park. The purpose behind this is to provide an opportunity for the public to view the magnificent big game animals of the West. It seems axiomatic that people will take a far greater interest in preserving wildlife when they have an opportunity to see what they are being asked to preserve. Under present conditions very few visitors, except hunters, ever have the good fortune to catch sight of the superb forms of wildlife that inhabit the Rocky Mountain areas. The story is told of a bull moose that held up two hundred motor cars. The animal accomplished this one day by quietly feeding near the highway in the northern part

of the Jackson Hole valley in full view of hundreds of car occupants who stopped to watch with delight the monarch having his morning browse. Such sights are a joy and a winter-memory. They stimulate an interest in the habits of wildlife and it is with this in mind that the first element of the Wyoming project will be created.

The plan for a display of the big game animals will be so arranged that they may be seen under entirely natural conditions. Areas have been selected extending along the east bank of the Snake River running southward from the outlet of Jackson Lake. This is a stretch of land a mile or more in extent, lying between the highway and the river. It is perfectly adapted to the purpose. Initially, three large areas will be made, the boundaries of which will be so designed and placed that they will be invisible. Elk, Moose and Mule Deer will inhabit the northerly area. The central area, which includes a long sagebrush flat running beside the river, will contain Bison. Pronghorn Antelopes and probably a few specimens of White-tail Deer will live in the southerly area. The numbers of animals of each species will be limited so that the areas will not be over-grazed or over-browsed. The scene is one of great beauty, with the blue of the Snake River in the foreground, the snow-crowned Tetons rising skyward in the distance.

As time goes on, it is hoped that plans can be worked out so that visitors to the area may get a view of Grizzly Bears and Black Bears. The difficulties of accomplishing this so that the animals may be seen in what are to all intents and purposes natural areas are not to be minimized, for if the showing of these great mammals — as well

*Crandall Photo*

The majestic range of the Grand Tetons thrusts skyward just west of Jackson Hole and forms a perpetually dramatic backdrop for the verdant valley. In the shadow of these great peaks the Zoological Society will help in the creation of a conservation ideal to inspire future generations of the American people.

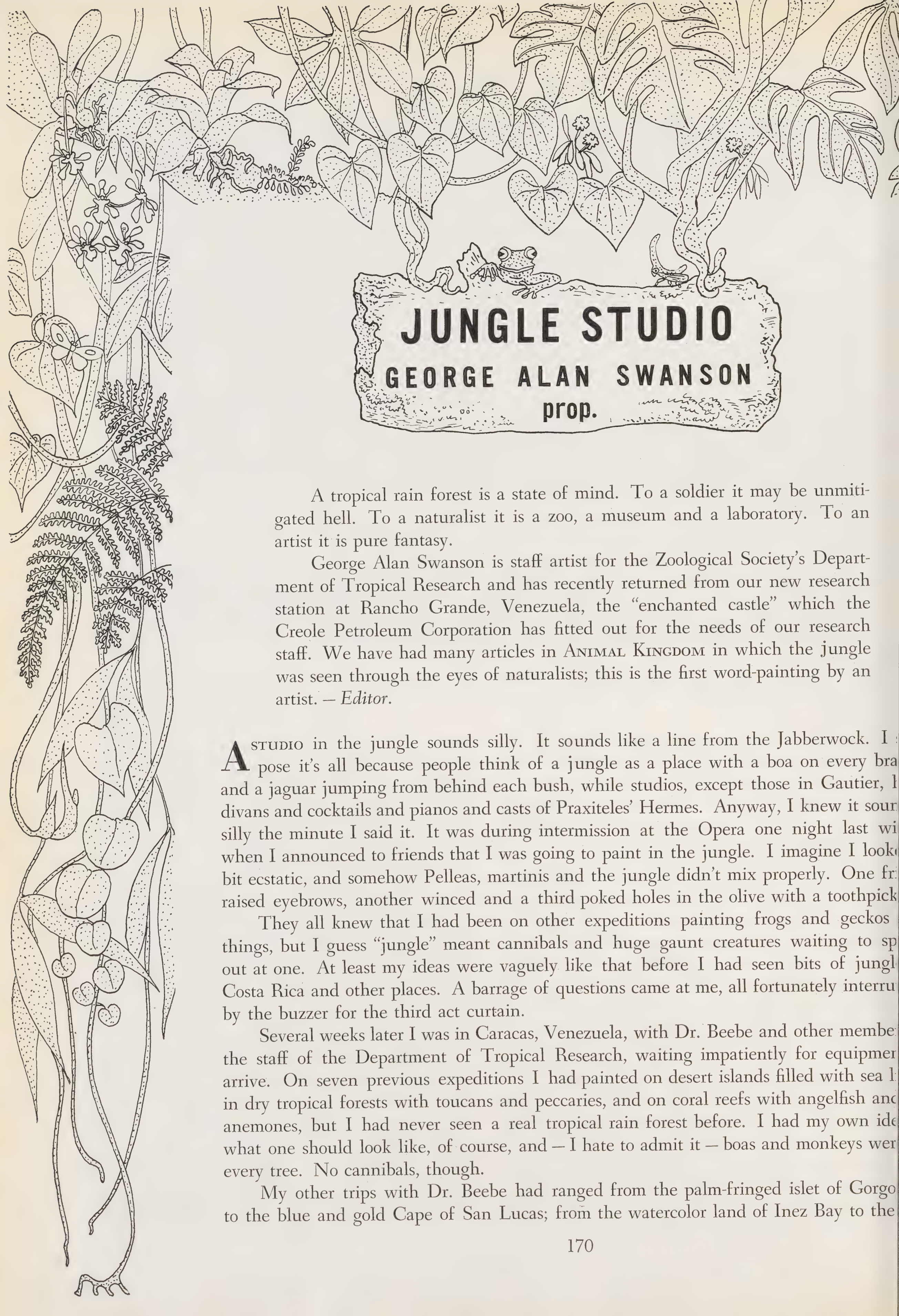
as any of the others — gives the impression that they are confined under artificial conditions, the primary purpose of the program will be sacrificed. An effort will also be made to provide protected resting and feeding grounds for wildfowl.

As part of the initial project an information building will be established. This is to be a source-center of information concerning the habits, management and conservation of wildlife. It is hoped as time goes on that there may be presented in this unit methods used in fish propagation and the stocking of streams, including a model fish hatchery. This same unit can well be used for a forestry demonstration, explaining the critical need for preservation of our woodlands.

This entire program was made possible because of the farsightedness and support of Laurance S. Rockefeller, an officer of the Zoological Society. During the course of various trips to Jackson Hole Mr. Rockefeller envisaged the great desirability of such a plan. The land being made available for this project is part of an area

purchased a number of years ago by Mr. Rockefeller's father. The State officials of Wyoming are collaborating actively in the preparation of these plans and the State Game Commissioner is prepared to provide representative groups of the various animals. The plan has received the warm endorsement of Mr. Harold L. Ickes, Secretary of the Interior, and Dr. Ira Gabrielson, Director of the Federal Fish and Wildlife Service, and it will be the purpose of the management to work in closest cooperation with the National Park Service, the Forest Service and other Government agencies.

From the point of view of the Zoological Society, we have certainly come upon a rare and wonderful opportunity. It will bring to our institution an intimacy with the wildlife conservation problems of the far West which could scarcely be gained in any other way. Such an opportunity comes, so to speak, only once in a lifetime and we certainly intend to do everything in our power to make the most of it.



A tropical rain forest is a state of mind. To a soldier it may be unmitigated hell. To a naturalist it is a zoo, a museum and a laboratory. To an artist it is pure fantasy.

George Alan Swanson is staff artist for the Zoological Society's Department of Tropical Research and has recently returned from our new research station at Rancho Grande, Venezuela, the "enchanted castle" which the Creole Petroleum Corporation has fitted out for the needs of our research staff. We have had many articles in *ANIMAL KINGDOM* in which the jungle was seen through the eyes of naturalists; this is the first word-painting by an artist. — *Editor*.

A studio in the jungle sounds silly. It sounds like a line from the Jabberwock. I suppose it's all because people think of a jungle as a place with a boa on every branch and a jaguar jumping from behind each bush, while studios, except those in Gautier, have divans and cocktails and pianos and casts of Praxiteles' Hermes. Anyway, I knew it sounded silly the minute I said it. It was during intermission at the Opera one night last winter when I announced to friends that I was going to paint in the jungle. I imagine I looked a bit ecstatic, and somehow Pelleas, martinis and the jungle didn't mix properly. One friend raised eyebrows, another winced and a third poked holes in the olive with a toothpick.

They all knew that I had been on other expeditions painting frogs and geckos and other things, but I guess "jungle" meant cannibals and huge gaunt creatures waiting to spring out at one. At least my ideas were vaguely like that before I had seen bits of jungle in Costa Rica and other places. A barrage of questions came at me, all fortunately interrupted by the buzzer for the third act curtain.

Several weeks later I was in Caracas, Venezuela, with Dr. Beebe and other members of the staff of the Department of Tropical Research, waiting impatiently for equipment to arrive. On seven previous expeditions I had painted on desert islands filled with sea life, in dry tropical forests with toucans and peccaries, and on coral reefs with angelfish and anemones, but I had never seen a real tropical rain forest before. I had my own idea of what one should look like, of course, and — I hate to admit it — boas and monkeys were in every tree. No cannibals, though.

My other trips with Dr. Beebe had ranged from the palm-fringed islet of Gorgona to the blue and gold Cape of San Lucas; from the watercolor land of Inez Bay to the



River in Venezuela with its scarlet ibises and crocodiles, but these were more or less ordinary places. When we were finally established at Rancho Grande, I found that it was more than another place. It had a definite personality of its own. Situated thirty-five hundred feet up the Maritime Andes, surrounded by cloud forest, it takes on the slender mystery of a dream, particularly when in late afternoon it drapes its shoulders in mists that seem to hang suspended in mid-air like an enchanted castle of medieval legend.

The idea of my having a studio in such a place appealed to my sense of the dramatic, but while I found out later that there were no floating white ladies as tenuous as sea foam drifting through its corridors on nights of full moon (as I had half expected), there *were* blue swallows and tanagers nesting in the walls, and at night red bats flittered in the halls after dark. Yellow-spotted snakes lived in the garden under the mango trees, frogs in the kitchen, lizards on the roof and spiders in every conceivable corner, so even though we owned no guns, we did possess the creatures usually thought of in connection with them. Perhaps we frightened the ghosts away. I shouldn't wonder, as the capture of any unusual animal was always attended by wild cries that echoed and re-echoed from the walls like the shrieks of so many maenads in the midst of dionysian revels — surely enough to send even the boldest painter hurrying back to ghostland.

But all thoughts of a haunted studio vanished soon enough under a deluge of carmine grasshoppers with blue legs, emerald tree snakes and alabaster hylas with jade pop-eyes, and my brushes flew to record color before death made everything an uninspired brown and brown.

People who have never painted in the jungle may wonder how anyone goes about painting a boa or beetle. In most cases there is no way but to pick your animal up and paint it. This was rather difficult at first, as I, along with millions of others, thought of snakes as bit, or were slimy. In fact, everything was difficult at first; the problems that confronted me were such strange ones that I wanted to give up and study abstraction.

To begin with, I had been taught modern painting methods and techniques, and the idea of fin rays to count and measurements to make from snout to thorax never entered my mind. I had been used to thirty-by-forty canvases painted with a certain amount of planning, and allowing color to do what it pleased after it was applied. So, while my first paintings were hardly done after the fashion of the Neo-Classicists, I *did* let watercolors do themselves on the paper. My very first jungle painting was of a scarlet amphipod, which I dare say it had a bit of charm, turned out to be an eyebrow-raiser resplendent in a variety of hues. The general color tended toward scarlet, but there were green and blue highlights and gold highlights, and countless legs and pleopods. From this disastrous experience I learned that spines had to be measured, scales paid attention to, and that the fish must actually look like itself. It was only after I realized this that things began to improve, even when I was sketching the contents of tuna stomachs with a hundred squilla and as many more squids and hatchet-fish.

And things didn't bite, and they weren't slimy! The only bite I ever had, besides *bête noire*, was from a green lizard, but the skin wasn't even broken. Once I tied the tail of the snake into knots around a branch to make him stay put. Instead of biting, he just coiled around to see what I was doing, and rested his head in my palm.





Before doing any painting, I had to have the specimens. Often these were brought to me by the other members of the party. Other times I went out and caught my own. In addition to the animals, I would collect background material to approximate as closely as possible the spot where the animals were found, and I would return to the laboratory with my haversack filled with fairy landscapes on bits of bark, *Enterolobium* seedpods like something in the window of a French confectioner, and twigs from mellow-trunked old trees with miniature forests of young ferns, mosses and seedling epiphytes. And beetles in cookie boxes, frogs wrapped in handkerchiefs wriggling in my pockets or a small pink-and-gray snake in a butterfly net.

Then would begin the all important job of getting everything painted before color would fade, death overtake a specimen, or something escape and fly away. This was always an exciting time. Before my eyes, caterpillars would become pupae, unpainted chrysalises turn into wet-winged butterflies, orchids bloom themselves to death, cassias drop their





ls, gem beetles take fits and run around in circles, and an anesthetized lizard revive
lose itself in a confusion of paint pots, vials and dried leaves. But order would be
ckly established and the agonizing matter of posing begin. This is the one problem that
ns to have no permanent solution. You can't just kill the things and expect the draw-
s to look alive. There is always a great amount of fluttering, wiggling, crawling and
yings-on like temperamental prima-donnas on opening night.

Sometimes the only thing to do is to mesmerize your subject, and you sit there trying
ook your model in the eye — a difficult feat in the case of multiple-eyed spiders. You
e heard something vague somewhere that if you do this long enough, things happen;
don't quite know what. But the right kinds of things never do happen, so you have
xperiment. Lizards and frogs are the easiest. You need just tickle their heads or sides
n a paint brush and they freeze into immobility with the most starry-eyed expressions
their faces. On the other hand, snakes refuse to be tickled. The more you tickle them
more vivacious they become, the more they perform sambas, loops and lovers' knots.

But despite the complications and problems, which are certainly endless and never
same, the result is so worth while. You not only experience a wonderful feeling of
on at having overcome obstacles and emerged with something halfway decent, but
have the most amazing lessons in aesthetics continually before you — revelations of
, color and design that you are able to study at first hand.

The colors alone make all the theories I learned in school seem ridiculous. Analagous,
dic and monochromatic schemes become senseless when one sees pure hues mixed in
reamed-of combinations. I have seen a caterpillar that must have been the inspiration
Bakst's design of the chief eunuch in Scheherezade. I remember a small insect arrayed
antastically in scarlet, jade, purple, turquoise and intoxicating magenta, in one primi-
harmony so mad and daring, that the decor of Coq d'Or and Thamar seems pallid
the dust of years.





Membracids, those cobbolds and cluricauns of the insect world, (and perfect models too), are crescents and trefoils reticulated with silver, or bearers of shields sequined with bronze, dull gold, and cool, dark viridian. Sometimes they seem textured like ancient glittering beaten metals and all the jewels of fabulous Golconda. To attempt even to approach accuracy with man-made pigments when one's palette should be set with smoldering gems and minerals and stuff made of moths' wings, is futile. I could but hint at the intricacies of pattern and design more finely wrought than the delicate silk tapestries of the Orient. As for those brilliant flashes like sunlight falling through shattered rubies, a few small spots of tempera put on with a two-haired brush must represent them. I could do no more.

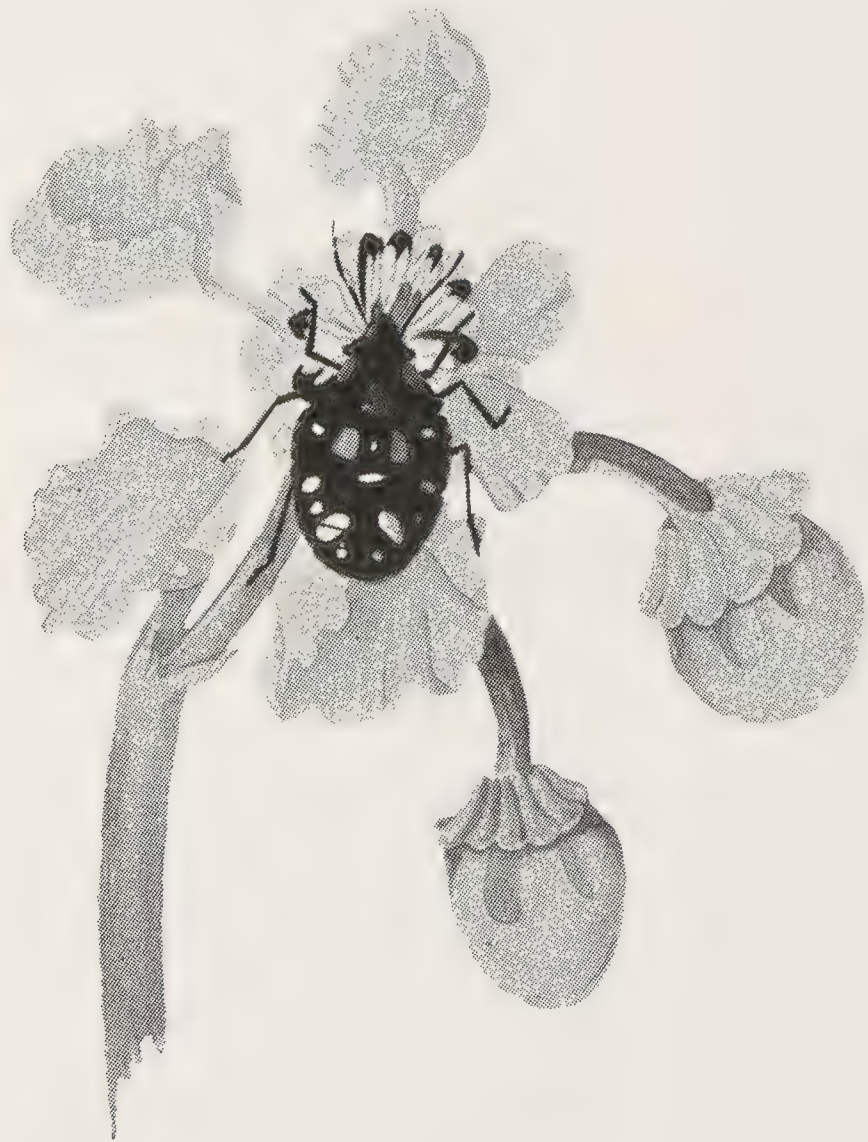
Frequently, I would take my painting materials and establish an *al fresco* studio in the jungle itself, and there on a rock in the rain forest I found myself quite at home among giant trees bound with lianas, gripped by strangling figs and dripping with the roots of aroids. My favorite spot was quite near the road to Ocumare de la Costa — a moist grove hung with delicate fern and lacy white begonias, where the larvae of fireflies glimmered like witch lanterns in the night, and a long gossamer waterfall sewn with paillettes of sunlight spilled over a cliff into a cool, green pool. These were the haunts of pale jade toucans.



and short-tailed quetzals whose feathers shone like the wings of the Angel of the revelation.

I would sit for hours sketching tiny plants and fallen leaves on the forest floor, or dead-leaved heliconias with their zig-zag inflorescences of flame and chartreuse and emerald, while around me wheeled brilliant birds—tanagers, orioles, manakins and callistes. The forest was filled with woodland voices—a bellbird clanging across the valley, jungle doves coming in thickets of thorny palm lianas, fat gold and purple wasps humming like spinning wheels and red howling monkeys delivering jeremaids from the top of Mt. Paraiso. Long like some latin chèvre-pied piping on a reed would be a small brown bird sitting on a red-tinted spadix of an aroid blossom. Birds, colors, songs and the incessant whispering of primeval forest giants merged into one glorious pastoral symphony. It was a temptation to dream away the hours and turn into a faun. But bugs and moths needed backgrounds, and it always seemed to be getting close to supper time, so the grotto would be left to the titis, and I would wander home hoping to get there before the twilight fog reached the mountain pass, the Portachuelo.

Each day brought new marvels and their attendant problems. I jumped from spiny plants to impossible caterpillars, to tadpoles of golden froglets found in the wells of bromeliads. Brushes, inks, transparent watercolors, opaque watercolors, oils, sketch pads and slide mounts were mixed up with yellow orchids, giant toads, hatching frogs' eggs in dishes, fresh jungle flowers in bottles and dead jungle flowers in jars, all in such startling confusion that I often wondered how I found the right thing at the proper moment. Little by little, however, paintings materialized out of the messes and the days slid by like a fantasy until it was time to pack once more and be off, leaving the green and violet velvety moths and resplendent gold beetles to resume their lives uninterrupted among the blossoms of the white ginger outside the window of my jungle studio.





Let's Take a Look at INSECTS IN WINTER

By **BRAYTON EDDY**

AS THE cylinder of time revolves upon its giant axis it brings about many changes. It causes buds to blossom and develop into fruit. It clothes the naked twigs in green leaves, then splashes the leaves with gay colors before tossing them to earth. It drives the bullfrog into the mud, the rattlesnake into its den. It turns the songbird southward and gives the ermine a coat to match the snow. Screen doors give place to storm doors, garden tools to furnace tools. All these things time accomplishes for plant and vertebrate life . . . but what of insects? What of that great body of animal life which outruns all others in point of species?

It is this question which led to an expedition that late in October penetrated half a mile into the little-frequented section of Bronx Zoo east of Beaver Pond. Only last July that same region yielded a bee tree for exhibition at the Reptile House and later furnished specimens for inclusion in a growing insect collection. It is both woodland and meadowland, rocky ledge and sluggish stream — an undeveloped corner in the very center of the world's most populous city.

Last summer this region throbbed with ceaseless Lilliputian activity. The Praying Mantis was observed to feast in triumph upon the reluc-

When the forests are bare and cold, what becomes of little creatures that sang and hummed and buzzed all summer long?

tant body of its mate. The Monarch Butterfly¹ emerged from its gold-pegged chrysalis to prepare itself for a long trek southward in company with its fellows. The digger wasp, nervous and excited, dragged its paralyzed prey beneath the ground to furnish unrationed meat for offspring it presumably never would see. The mosquitoes presented their bills, the yellow jackets their drills, and the crickets their raucous symphony until the cylinder of time made its scheduled round to winter.

Then all became silent, inactive, uncolorful. It was as if a magic wand had been waved to cast a spell over the entire scene. Where were the insects of yesterday? Did they follow the sun and disappear beyond the brink of the horizon? Did they bury themselves in the soft bosom of the earth to await the clarion call of a brighter day? Or did they, perchance, perish completely with the full circuit of the earth about the sun to rise again only by seeming spontaneous generation?

None of these alternatives which have plagued the mind of man since the beginning of time were found by our "expedition" to be completely true. Artfully concealed under rocks, beneath shedding bark, in the ground and on the trees were insects in various stages of development. Eggs, larvae, pupae, adults — but always dormant. Dormant not from choice, perhaps, but from necessity. Their blood, like summer oil in a motor car, thickens with the cold and makes it practically impossible for them to operate. Since they cannot change their blood, as we do our motor oil, and since unlike ourselves their blood contains no oxygen to give them warmth, they must wait for the heat of the sun to thin it out. They are cold-blooded animals, animals which assume the approximate temperature of the surrounding atmosphere. When it falls much below 45° Fahrenheit they become inactive, at the mercy of whatever delving sleuth chances to come their way.

From the slender twigs of a hawthorn dangle many bobbin-shaped objects that might be withered leaves, if the tree were not otherwise bare. They hang like miniature Christmas decorations offset against the sky. They are small silk bags, ranging from an inch to an inch-and-a-half in length, decorated with shaggy bits of well-browned leaves. The smaller bags are invariably empty, but within the larger ones are the soft yellow seeds of a future generation.

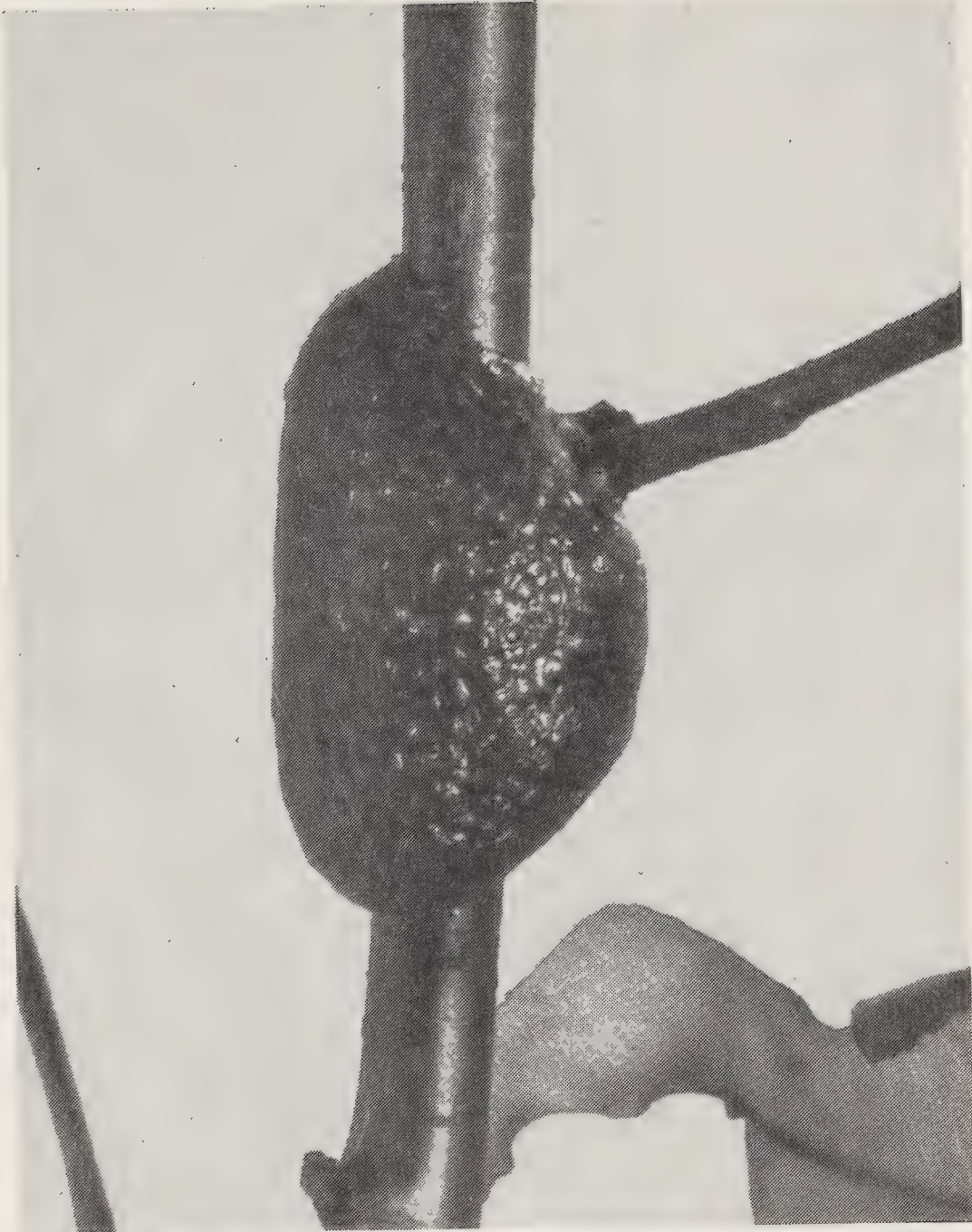
The development of the Bagworm² is most fascinating to behold. Almost immediately upon hatching from its egg it proceeds to cover its nakedness. Not from an undue sense of modesty, to be sure, but rather from a desire for self-preservation. Being a caterpillar, unprovided with a hard shell, it would soon succumb to the insatiable appetite of its feathered foes if it did not take precautions against them.

Straightway it crawls to the nearest leaf and, clinging by its front legs, with its tail in the air, deftly proceeds to weave a silken bag about itself. This bag is tough and the threads of it are exceedingly fine. In reality it is not a bag at this time, but rather a tube which bulges in the middle. The top is open to allow the head to emerge for feeding; likewise the bottom is open so that shed skins and waste may be discarded. The outside of the tube is decorated with bits of matching foliage to make it inconspicuous.



These are not seedpods, but cocoons of the Bagworm. Among the leaves they are inconspicuous; when the tree is bare, their toughness protects them.

When the Bagworm feels itself about to undergo a change, to convert into a helpless chrysalis, it chooses a solid support and lashes its tube in place. Usually the support is the twig of a host plant, of which there are many species besides the hawthorn. Instinctively it avoids attachment to a leaf, which inevitably would drop to earth in the fall and prove disastrous. The tube, now converted into a pendant bag, is given an extra lining of silk before the worm makes its final



More than 300 eggs of the Eastern Tent Caterpillar are in a tight, waterproof cluster around this wild cherry tree twig. The eggs will hatch next April.

moult. Should a bird even suspect there was a tempting morsel within, it would find it exceedingly difficult to peck a hole through this swinging object.

In three weeks the chrysalis works its way down into the bag and, if it is a male, makes its escape through the lower end as a moth with glassy wings. But if it is a female it has neither legs nor wings to escape with. It merely protrudes its memberless body for the mating, then retracts to lay its eggs within one end of its chrysalis case. There the eggs, protected by case and bag, withstand the rigors of winter while the mother drops to earth through the escape hole and perishes.

On the twig of a wild cherry tree, nearly shorn of its leaves by a recent frost, is a slight swelling almost the color of the bark. The swelling extends along the twig for about three-quarters of an inch and is rounded at either end. Close examination reveals that it is made up of tiny round eggs, more than three hundred of them, laid in a belt line about their support. A shiny coat of glandular shellac, applied by the parent moth, protects them against weather and no doubt against lesser enemies.



The large, brown cocoon of the Cecropia moth is familiar to many persons who have tramped the woods in autumn. Inside is the mummy-like pupa.

But man has come to recognize these egg masses as belonging to the brown-winged moth of the Eastern Tent Caterpillar.³ Because these caterpillars make ugly spring nests high in small crotches of both apple and cherry trees, defoliating the limbs as they go, he has declared unmerciful war against them. Last spring many dozens of nests were clipped from the park trees and destroyed, but from mid-May through the winter to early April this insect exists only as a developing embryo in a sheltered huddle of eggs.

Attached to a stem of goldenrod is one of the most marvelous egg clusters of all time. And no wonder, for it is made by one of the most interesting and human-like of insects — the Praying Mantis. One species is native to this country, but two others were introduced from Europe and China because of their capacity to eliminate pests. It is believed to be the only insect that can turn its head without turning its body. When standing erect upon its four rear legs, holding its front ones alert for grasping, it reminds one of a wild horse rearing for action. The small triangular head with its lidless eyes follows every movement of friend, foe or shadow.

Any low-growing plant is likely to be chosen



Beneath the loose bark of a dead elm tree one may find the silk-cotton wad that protects the eggs of the Grass Spider. The female, here shown guarding her eggs, will not survive the cold of the winter, however.



Not all the tiny creatures of summer spend the cold months as eggs; these yellow grubs of the Elm Borer Beetle will pass the winter in this form among trails they have chewed under the loose bark of some log.



Dig into the soggy wood of a dead oak log and one is almost sure at this time of the year to turn up Horned Passalus Beetles that will scramble quickly out of sight in the tunnels they have chewed in the wood.

as an attachment for its eggs, and there may be more than a hundred in a cluster. The female mantis clings head down to a twig, stem or branch and pours them forth from the end of her body.

But eggs laid in a cluster should have protection against both storms and enemies. This the Praying Mantis provides and, unique among insects, it also seems to provide protection against extremes of temperature. Its nest, indeed, is built upon the modified principal of a thermos bottle only whereas the thermos bottle depends upon a dead air chamber between the glass interior and the metal exterior, the Praying Mantis utilizes a glandular secretion which it whips full of tiny air bubbles as it pours forth from the abdomen. On contact with the air, the walls of these bubbles soon harden to form a crust, not unlike the shell of an almond, beneath which the eggs lay hidden in comparative safety and seclusion. Sometimes these egg cases require as much as twenty-four hours to complete, but results have shown that the time was well spent.

Beneath the loose bark of a dead elm tree we find a medium-sized spider which one is accustomed to observe running over a doily web spread out upon the grass. Early morning dew makes the doily most conspicuous. At one end is a tunnel which leads downward for escape, and overhead is a net-work of fine threads to trip the unwary flier. Down will tumble a mosquito or a small moth onto the silk doily, like a trapeze performer that has missed the mark, and the alert Grass Spider⁴ will rush forth from its frail tunnel to seize it.

The spider itself is truly not an insect, since it has eight legs instead of the qualifying six, but it is interesting to know where it spends the winter and how. On removing the bark from the elm tree, a cotton-like wad was disclosed upon which the spider rested. It had chosen its site wisely for it was well away from the grass plot where presumably its enemies would be lurking. Beneath the wad were tiny round globes, eggs like seed-pearls, which were held together by their sticky shells as well as by the covering fluff. Although the mother was found guarding the eggs when they were revealed, she will not survive the winter. Instead her prostrate body will be seen in the spring close by the seeds of her production.

But the animals of our concern do not spend the winter only as eggs. In the same log, half in the bark and half in the sapwood, were several yellow grubs streamlined from front to rear. Their black jaws must have been exceedingly strong for they had gnawed circuitous paths down a line set by the cambium. A trail of packed sawdust revealed their path before arriving at the socket-like depressions in which they were discovered.

These grubs were the offspring of a gray, black-spotted, Elm Borer Beetle⁵ which attains a length of half an inch. Generally it matures in late May and deposits its eggs beneath the bark of trees either dead or near dying.

As we turn over a fallen log, another larval insect is revealed. Motorists are familiar with it, for like a hen, it seems forever desirous in the fall of crossing the road to get on the other side. Its hair resembles a pompadour clip — black at both ends but red in the middle. This is the Banded Woolly Bear⁶ caterpillar which, having consumed its quota of plaintain and other fodder, seeks a shelter under logs and stones where it remains tightly curled against cold weather. In fact it is one of the very few caterpillars in New York which can boast of this accomplishment.

Some insects over-winter in the twilight zone between wingless caterpillar and winged moth. On the limb of a low cherry tree we find such an object. It is a large, brown cocoon which forms the sleeping bag of the famed Cecropia.⁷ Within this bag is a mummy-like pupa, dark brown but bearing the imprint of the moth it will later become.

The bag itself is made by a caterpillar, some three inches long, whose back is decorated with ornate pegs like those from a cribbage board. It rears upon its hind pro-legs, using its front legs to draw forth the liquid silk from its modified salivary glands. Moving its body up and down, it slowly attaches loops of thread lengthwise of its support before beginning the outer scaffold of the cocoon proper. Within the outer cocoon is later constructed an inner cocoon with strands of fluffy silk acting as a buffer between. Only then does the maker shed its colorful caterpillar skin for the drab case of a pupa.

A survey of insects which over-winter as adults, often in clumps of weeds next to fence rows, shows a surprising number that attack

food plants. There is the Striped Cucumber Beetle,⁸ the Asparagus Beetle,⁹ the Mexican Bean Beetle,¹⁰ the Squash Bug,¹¹ the Tarnished Plant Bug¹² and many others. They survive by reason of the fact that they conceal themselves under plant debris. But there is one over-wintering adult, a protector rather than a despoiler of plants, which seeks shelter in houses and hollow trees — the ladybeetle.

The Two-spotted Ladybeetle¹³ is found behind a sliver of punky wood inside what might have been a bat roost, although if bats had been there it probably would have been eaten. Its size is pathetic, scarcely larger than a split pea, and its convex body is mahogany colored with one black polka dot on each wing. As a friend of man it holds front rank, since both in grub and adult stages it feeds upon herds of plant lice.

A pile of coarse sawdust at the base of a rotting oak log invites investigation. The bark is torn away, revealing large tunnels in the soggy wood beneath. These tunnels are quite unlike those made by the elm borer since they do not involve the underside of the bark but confine themselves principally to the heartwood. It is not long before a glossy black beetle, the size of one's thumb, its back ridged like corrugated iron, comes tumbling into view. It alerts its leafy antennae, then tries desperately to bury itself. When we pick it up between thumb and forefinger it makes a squeaky noise of protest by scraping hard areas on the upper surface of its abdomen against the lower surface of its wing covers.

Our "expedition" uncovered no fat grubs in the log, but there were several more Horned Passalus Beetles.¹⁴ As soon as they were exposed they quickly tried to get out of sight and it was amazing how soon their clumsy bodies could disappear inside a log runway. Earlier in the year both adults and grubs may be found in the same enclosure, the grubs apparently depending upon their elders to break up the wood for them.

A strip of tar paper which evidently had lain on the ground for some time was raised and out jumped several female Field Crickets.¹⁵ One can tell they are females because they pack — not a pistol — but a long, black sword-like ovipositor. And they cannot talk with their wings, the way their mates do so successfully, by drawing the sharp edge of one against the file-like vein of another. Their sole desire is to escape. No doubt they have already planted their winter eggs in the soil, but their own chances of surviving until spring are slim indeed.

¹ Monarch Butterfly, *Danaus plexippus* (L.)

² Bagworm, *Thyridopteryx ephemeraeformis* (Haw.)

³ Eastern Tent Caterpillar, *Malacosoma americana* (F.)

⁴ Grass Spider, *Agelena naevia* Walck.

⁵ Elm Borer Beetle, *Saperda tridentata* Oliv.

⁶ Banded Woolly Bear, *Isia isabella* (A & S.)

⁷ Cecropia Moth, *Samia cecropia* (L.)

⁸ Striped Cucumber Beetle, *Diabrotica vittata* (F.)

⁹ Asparagus Beetle, *Crioceris asparagi* (L.)

¹⁰ Mexican Bean Beetle, *Epilachna varivestis* Muls.

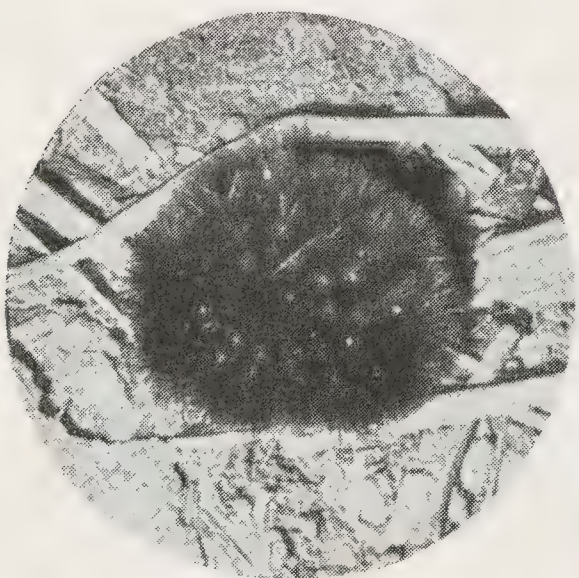
¹¹ Squash Bug, *Anasa tristis* (DeG.)

¹² Tarnished Plant Bug, *Lygus pratensis oblineatus* (Say)

¹³ Two-spotted Ladybeetle, *Adalia bipunctata* (L.)

¹⁴ Horned Passalus Beetle, *Passalus cornutus* Fab.

¹⁵ Field Cricket, *Gryllus assimilis* (F.)



Above — Banded Woolly Bear caterpillar as it rolls up. Right — wintering Crickets.



Above—Two-spotted Ladybeetle may be found hiding among rotting, punky wood.

A Swellfish Story

By MYRON GORDON

SINCE autumn, the frosty counters of the best fish shops in town have displayed, as they have for several seasons now, a new sea-food delicacy called "blowfish tails." Along the north Atlantic, fishermen know the blowfish under a long list of characteristic names: swellfish, balloonfish, globefish and puffer are samples. What surf-casters call them is unprintable, for the sport-fishermen have a strong and colorful way of expressing their low opinion of the puffer for stealing bait intended for fishes they hold in greater esteem. Salt-water anglers may be surprised to learn that these fish, so repugnant to them, have risen mightily and are now associated in the market places with the lordly salmon, the gamey striped bass, the handsome red snapper and the delicate pompano.

The debut of blowfish tails as respectable sea food has been part of a successful campaign of the government-sponsored National Research Council Committee for the Utilization of Marine Products together with the Connecticut State Board of Fisheries and Game, directed towards increasing the use of a number of so-called "trash" species heretofore neglected, little esteemed or purposely avoided in the great markets. Responsible authorities hesitated a bit before giving blowfish tails a clean bill of health because the common American species of the swellfish, *Spheroides maculatus*, belongs to the world-wide fish family known as the Tetraodontidae, the four-toothed beasts of the sea. Many of the members of this fish fraternity are notoriously poisonous, and this is particularly true of the tropical species, especially those of the seas around the West and East Indies.¹

The pun in the title is intentional, for Puffer lore is full of entertaining stories about these poisonous but edible fish.

Biological chemists, in recent researches into the nature of poison of the puffer, have found by modern scientific methods what oriental sea-food chefs have known for centuries, that the toxic properties of the tetraodonts are concentrated in the visceral organs, the liver, the kidneys, the gall bladder, and in the genital glands, the ovaries and testes. The muscles are free of the toxin unless contaminated during the spoilage period between the catching and the eating of it. In tropical countries without proper refrigeration techniques, it is easy to see how the entire puffer might become permeated with the poison originating in some of the internal organs. The chemists had never analyzed this kind of poison before, and when they extracted it in final form they called it *tetraodontoxin*.

Pharmacologists, in testing the suspect organs of the puffer, found that the potency of the toxin varies with the seasons, being most virulent in the spring when the fish are preparing to spawn and during the breeding period. In tropical regions, lacking the definite seasonal changes, the puffers may always be dangerous. Fortunately, along the northeastern Atlantic seaboard, blowfish are taken in large and commercially profitable quantities only *after* their spawning season. The fish are processed immediately after being taken from the nets; nothing is saved except the tail muscle. Large quantities of blowfish tails have been marketed and eaten in the East, yet no cases of fish poisoning have been reported in this section. Blowfish tails are sweet,

¹ Nigrelli, Ross F. "Fish May Be Poisonous, Too," *ANIMAL KINGDOM*, Sept.-Oct., 1944, page 122.

delicate in taste, resembling in texture and flavor the white meat of the edible crab. They may be a nuisance on the end of the surf-caster's hook, but they are swell on the prongs of a dinner fork.

Up to the time our sea-food epicures spread the good news that blowfish tails make a delectable dish, the American swellfish were left pretty much to their own ways of life; yet it is not likely that their numbers in the sea will decrease, even if the demand from the shore-dinner trade should soar. Few fishes have so many physical advantages as they, and they make the most of their peculiar anatomies in a variety of tricks unmatched in the water wilderness.

Walter B. Savery of Wareham, Massachusetts, with his field glasses spotted an osprey diving for swellfish in about two feet of water on Little Harbor Flats. He saw the bird catch one and rise with it into the air. At that instant the fish started to inflate, and it swelled up so quickly that it was out of the hawk's talons before the bird could give that characteristic shake to its body that always follows its dive. Savery saw the fish-hawk strike successfully four times, and each time the swellfish puffed itself out of the bird's clutches. As the fish fell from a height of about ten feet, it seemed to bounce on the surface, float for an instant, deflate, and then sink out of sight.

When, at the New York Aquarium, the late

Director Charles H. Townsend placed a big, voracious scup, *Stenotomus*, in a tank with a dozen small puffers, the big fish attacked at once. Instantly the baby puffers, only two inches long, inflated themselves and became too large to swallow. The porgy could not get hold of its cue-ball-like opponents, but merely knocked them about.

William W. Welch of the United States Bureau of Fisheries and Charles M. Breder, with temporary laboratories at Atlantic City's Million Dollar Pier, discovered that puffers learn their trick of self-inflation early. During their studies of the fish's life habits along the New Jersey coast, the ichthyologists found that adult puffers spawn in June and July and that an eight-inch female deposits about 200,000 eggs, which form clusters and appear like honey in the comb. The eggs hatch in four to five days; the larvae are thin and transparent—little resembling their parents. Later, when they are a quarter of an inch long, they begin to show some of the tricks of their trade. Their bodies are extremely distensible, and when they inflate themselves they look like tiny balls about the size of peas. Fully swollen, their skins are literally turned inside-out and their eyes seem to pop out of their heads—all of which gives them a grotesque appearance, to say the least.

An eight-ounce swellfish—this is the usual weight of an adult—can swallow 40 ounces of



The common American species of the Swellfish (*Spheroides maculatus*) is a rather undistinguished citizen of the ocean when it is at rest. But it belongs to a family that is notoriously poisonous, especially in the tropics, and when it swells up—well, just turn the page and you will see what happens to it then!



The Swellfish really SWELLS! This one happens to be filled with air and is light enough to bounce if it were dropped on the pavement. In the water the Swellfish inflates itself with water, of course, and then it takes a predator with a sizeable mouth and a disregard for prickles to make a very hearty meal of it.

water during its puffing act. By a clever anatomic trick, the water by-passes its stomach and enters a sac of its body cavity.

Back in 1815 Dr. Samuel L. Mitchell, then Professor of Natural History at the University of New York, reported that puffers inhaled air with such vigor when lifted from the water that they could easily be heard, and that when fully inflated they were as hard as footballs and could be kicked about. He said he had seen them bounce from the surface of a rock against which they had been thrown.

Albert Eide Parr, now director of the American Museum of Natural History, in the early days of his biological career worked in the old New York Aquarium, where he watched the peculiar antics of the puffers. What puzzled him

was the knowledge that although *Spheroides* has no ribs, and no ventral fins, and its soft pectoral fins are situated quite high up, the fish, when resting on the bottom manages to support its body weight from pressing down and interfering with the functions of its internal organs. Parr discovered that the puffer has a built-in, pontoon-like landing mechanism ingeniously contrived from its breastbones, which he calls "the post-clavicular apparatus." As the puffer sails down from a height to the loose coral sand, it spreads its two ski-shaped bones within its flabby belly wall and lands in an upright position.

After a vigorous run around, the puffer settles to the bottom and rests on its broad, rather flat belly. Its mouth remains partly open and its body heaves up and down as if it were out of

breath and trying to recover it quickly. As it lies there, stretched out, wide-eyed, mouth agape and heaving, it looks like a frightened baby calf freezing to the ground, hoping for the best.

One day Parr noticed that just after *Spheroides* landed on the sand it pointed its head downward and with short, quick, energetic movements pushed itself partly into the sand. Then the half-hidden puffer immediately covered its exposed back by throwing sand on top of itself, using the long, flat bones of its postclavicular apparatus as shovels. This trick undoubtedly gives it the advantage of invisibility, which it may use either to surprise its prey or to hide from its enemies. But the puffers do not reckon with the human mind. Charles M. Breder says that the puffers in working themselves into position create two prominent ridges of sand over their backs, which diverge to the rear in a characteristic way. He says he can easily spot their secret hideouts in their natural habitat in water off the New Jersey seacoast. In working in the loose sand, the puffer's eyes are protected by semi-transparent eyelids, which serve them like eye-shields on a sandhog's helmet.

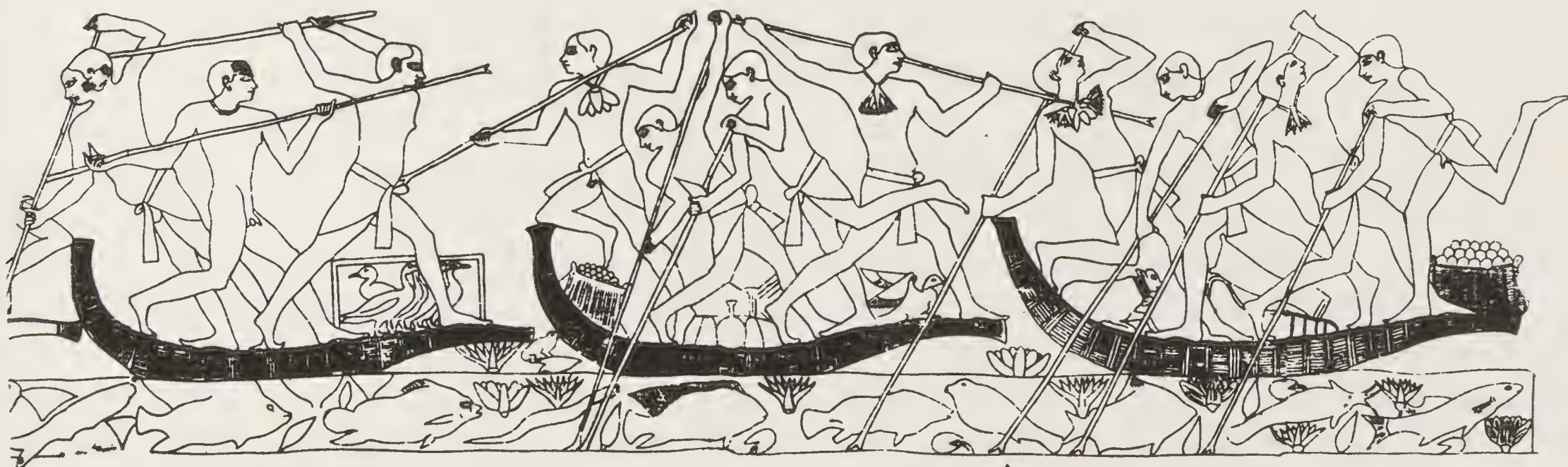
According to Breder, a group of tetraodont puffers will often gang up on a solitary blue crab. In attacking the decapod, the puffers aim their bites at the region just between its eyes, for it is here that its vital nerve ganglion lies; once this invertebrate "brain center" is hit, paralysis sets in. Both the crab and the fish "sense" the crucial importance of the area. The crab defends it with its powerful, pincer-like chelae, which hover in front of its eyes like a hockey goalie at his net.

The fish seem to go into a huddle, then scatter, and make individual sallies at the crustacean,

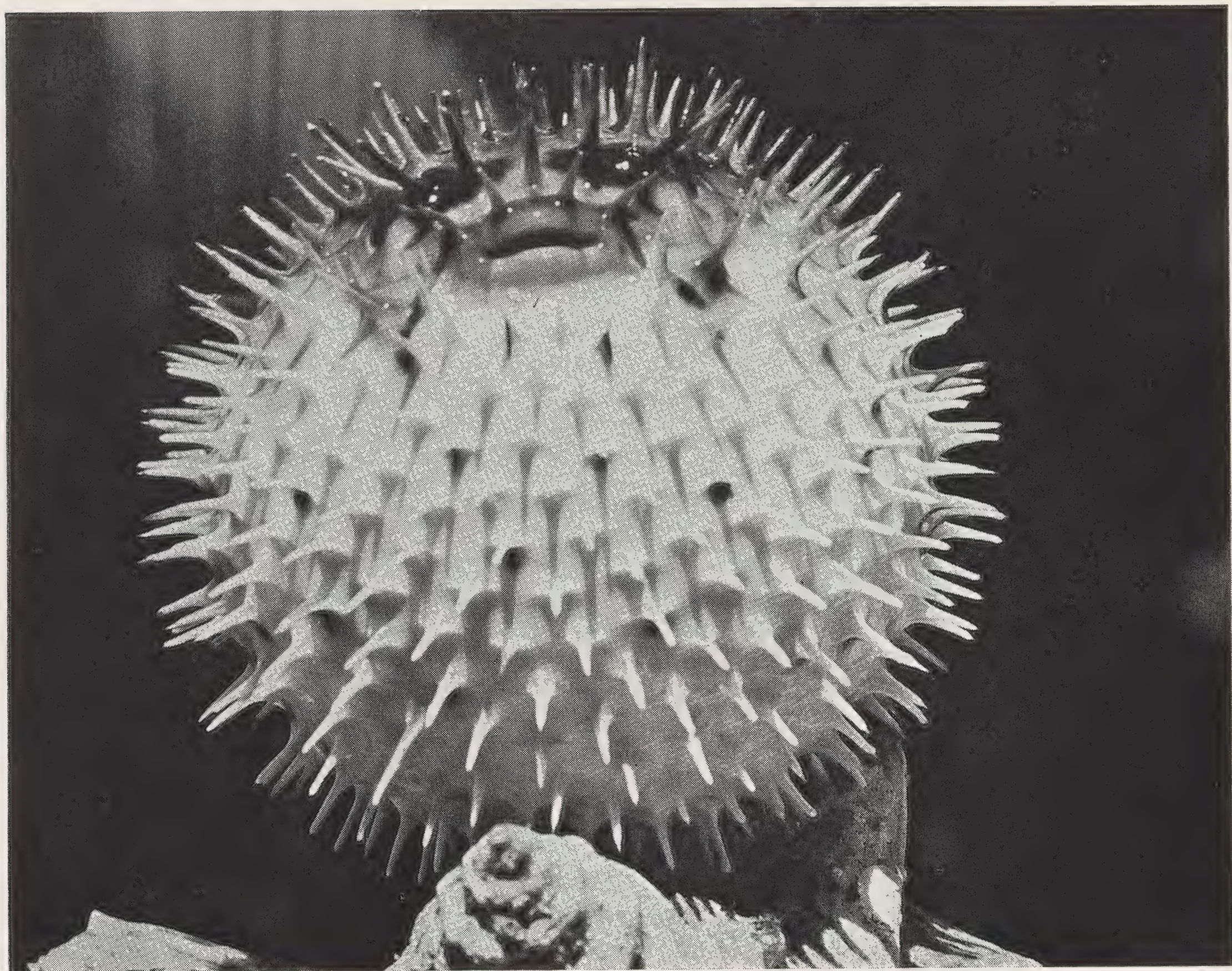
nipping it at the less well-protected areas. Once a puffer carelessly got within range, and the crab got in its lick by grabbing the fleshy lip of the aggressor with its powerful pincers. As the puffer violently shook its head to free itself, the brittle joints of the crab's claw-leg broke, making it vulnerable in the final battle maneuver. Another puffer closed in and with its powerful teeth crushed the crab's vital nerve center. Crab-meat was scattered all over the battle scene for a moment, and then everything was calm. Breder, in witnessing this strange war between the invertebrate and the vertebrates, was puzzled about the implications of this uneven struggle, saying, "The spectacle always suggests concerted action and the possession of more reasoning power than we have any right to assign to fish."

Most of the four-toothed puffers, the Tetraodontidae, are marine and are found in every sea. Traveling up the estuaries in India, Ceylon, Malay and Egypt, three species of tetraodonts are able to pass the tidal rivers and live in fresh-water streams.

An Egyptian species, *Tetraodon fahaka*, lives in the fresh waters of the Nile. The *fahaka* is a famous fish and one that must have had some important symbolic virtue, for it appears commonly in the mural paintings of the ancient Egyptians. Unmistakable likenesses of it are found in the fishing scenes drawn on the walls of the pyramids of Giza and Saqqara. The eastern half of the south wall of Ptah Hotep's tomb at Saqqara is decorated with an elaborate battle scene being fought on water. The pictures represent a cross section of the battle. Above the water line the battle royal goes on furiously. Below the water line, below the keels of the war vessels, as if in sharp contrast to the warlike scene above,



Ichthyologists have identified the puffed-up fish in this ancient Egyptian drawing as the *Fahaka* (arrow points to the fish), from the fresh waters of the Nile. The battle scene is carved on a tomb at Saqqara.



Myron Gordon Photo

Probably the most spectacular of the puffers is the Porcupine Fish, *Diodon hystrix*, that is armored with sharp and exceedingly disagreeable spines. In the water or in the air it can inflate in a very few seconds and it is a bold enemy indeed that will dare to attack this "hedgehog" of defense on its home grounds.

the artists painted a lovely scene of peaceful aquatic life. A partly inflated *fahaka* may be recognized easily among the aquatic creatures.

Tetraodon fluviatilis is the scientific name of the fresh-water puffer of India, and its name conveys the meaning that it is a four-toothed beast that has come from the river. It is a little fellow; the largest ones never get much larger than six inches. But in spite of its diminutive size it is a voracious and predatory fish.

Otto Thilo tells of the remarkable behavior of this globefish, or, as Thilo prefers to call it, *Kugelfische*. To avoid being swept downstream, it creeps through narrow openings between stones, or behind empty shells of snails which it has piled up, and swells out its body like a balloon. It is then so jammed in between stones that it remains just where it wants to be without effort.

The fresh-water puffer of India has recently been brought to America by an enterprising tropical-fish dealer, and these new fish immigrants are now quite popular in the home aquarium. They eat all kinds of fish food but prefer raw meat; they are inclined to be scrappy; they are too small to do much damage with their strong teeth when handled; they will go obligingly through the typical swelling antics of their tribe when lifted from the water and tickled under the chin. Aquarium-fish keepers are excited; they have discovered another parlor trick.

The porcupine fish, the two-toothed puffers, like their four-toothed relatives, do not rely solely on their inflationary trick for self preservation. They, too, have powerful jaws, which are equipped with a brace of chisel-like teeth. These two prominent dental outposts of defense have given them their technical family name of Diodontidae.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

The Trumpeter Swan Situation Continues Satisfactory

The plan for preserving the Trumpeter Swan worked out last year by the Fish and Wildlife Service authorities with the advice of Jean Delacour of the Zoological Society's staff is making satisfactory progress, Mr. Delacour was able to report after a late summer visit to the wildfowl refuges in Wyoming and Montana.

The swan situation on the Red Rock Lakes refuge area seems to be stationary, with about 170 birds wintering on the feeding grounds. Twenty cygnets hatched in 1945 were caught and successfully transported to the Malheur Lake refuge in Oregon, and it was found that 18 of the birds transported there from Red Rock Lakes last year were in perfect condition.

Mr. Delacour expects to pay another visit to the West next spring, at which time further refuges will be selected in Oregon, Idaho and Nevada. In these the cygnets hatched in 1946 will be established in the autumn.

"Expedition" in the Zoo

The "wilds" of the Zoological Park's own grounds continue to be a fruitful source of animals — witness the Alaskan Red Fox that was captured in the Zoo a year ago, the innumerable raccoons and opossums, owls and hawks that have been taken here in late years, and now the capture of a real rarity, a Colombian Red-bellied Squirrel (*Sciurus saltuensis bondae*).

The handsome squirrel, about the size of our familiar Gray Squirrel but brightly marked, was first noticed on the paths and in the shrubbery late in the summer. It appeared to be tame and a few efforts were made to capture it, but none of them succeeded until October 13 when Head Keeper George Scott of the Bird Department set out on an "expedition" with a pocketful of peanuts and a small hand-net — the latter carefully concealed behind his back.

He caught the squirrel on the second peanut.

We can only suppose that the squirrel had escaped from some private owner — or, possibly, had been brought back by a Service man and was liberated in the Zoological Park where it was sure to find enough to eat. It could not have withstood the rigors of a New York winter, however. Temporarily the squirrel is in the Lion House "nursery" under the care of Mrs. Fred Martini, wife of the Lion House keeper.

Citation for Keeper Hansen

Staff Sergeant Robert Hansen, now of the Army but lately (and in the future) of the Mammal Department keeper staff, has been given a citation for "heroic achievement in action against the enemy on 26 November, 1944, in France."

The citation states that when his isolated position was attacked by four enemy riflemen with automatic weapons, Sergt. Hansen disregarded the fact that he was outnumbered, killed the leader, and drove off the other attackers, thereby preventing a penetration of our lines.

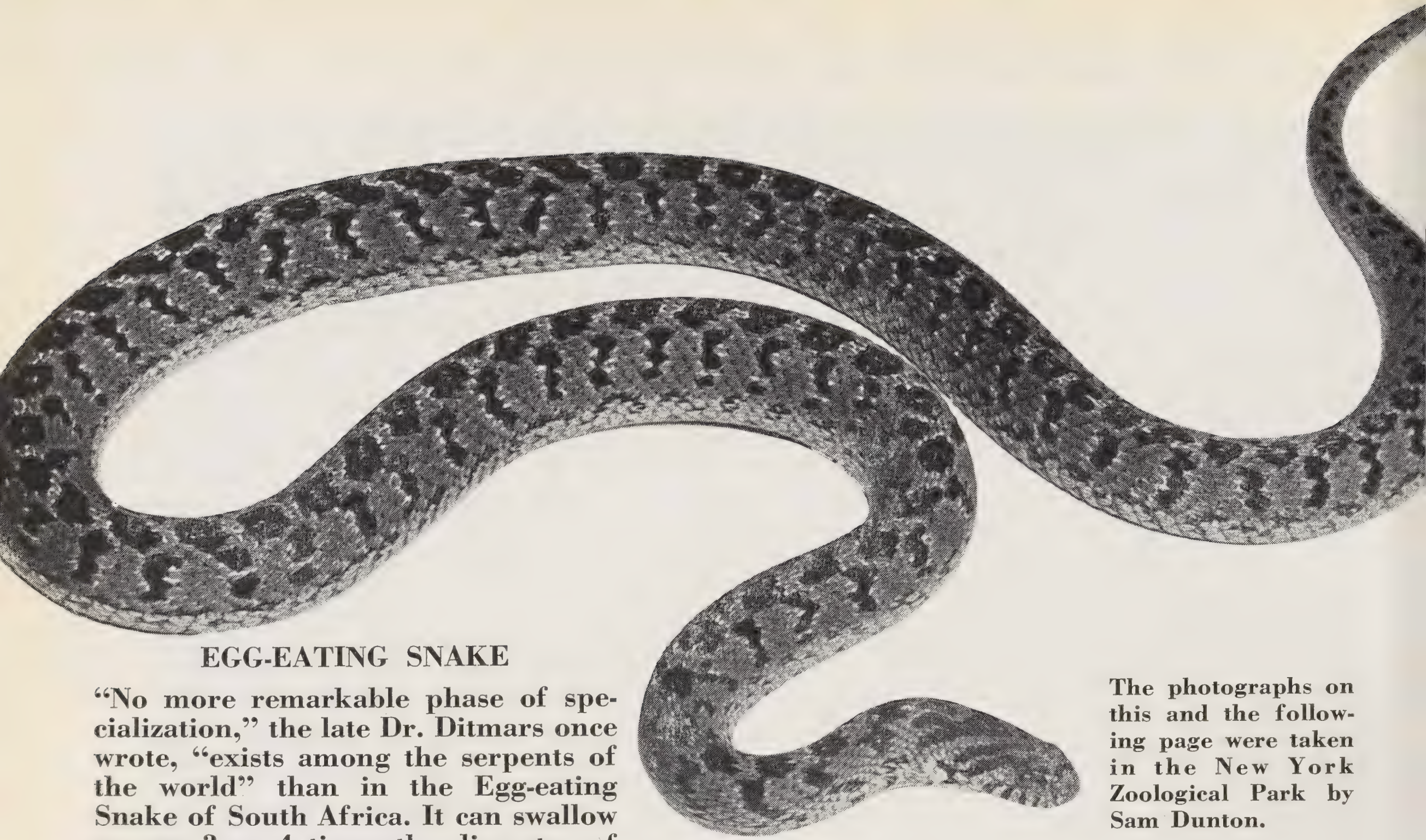
Sergt. Hansen is the husband of Mrs. Ruth Hansen of the Zoological Park's business office.

The Sealions Are Home Again

After about three weeks of exile in the Penguin Pool (during which time the Penguins suffered an exile of their own to Snake Island), our California Sealions are back home in their big pool on Baird Court. During the absence the underwater portions of the pool were given several coats of light blue paint, so that the swimming actions of the animals are quite visible even when they are several feet below the surface.

* * *

Newest publication of the Society is a large sheet of animal pictures, printed on one side only so the pictures can be cut out for scrapbooks, mounting on cardboard, and the like. The first Picture Sheet, which it is hoped will result in a series of sheets on the mammals, birds and reptiles of each continent, is called "Mammals of All Continents," and contains 37 pictures. It is for sale at 50 cents a sheet.



EGG-EATING SNAKE

"No more remarkable phase of specialization," the late Dr. Ditmars once wrote, "exists among the serpents of the world" than in the Egg-eating Snake of South Africa. It can swallow an egg 3 or 4 times the diameter of its head. This is *Dasypeltis scaber*.

The photographs on this and the following page were taken in the New York Zoological Park by Sam Dunton.

The Death of One Giant Panda

The death on October 4 of the smaller of our two Giant Pandas must, with regret, be recorded here.

Post-mortem examination revealed that it died of an acute intestinal inflammation which had produced peritonitis, the inflammation resulting in an obstruction prohibiting the passage of a bolus of bamboo.

The animal was found dead on the arrival of its keeper in the morning. It had been with us a little more than three years and nine months, having been secured in Chengtu, China, by Mr. Tee-Van as the gift of Mmes. Chiang and Kung.

On arrival at the Zoological Park on December 30, 1941, this particular specimen — supposed to be a male because it was larger and more aggressive than its companion — weighed 62.7 pounds. It weighed 201 pounds two days before its death, while its companion weighed 298 pounds. Autopsy confirmed a discovery of a few months ago that it was a female — as we still believe our remaining Giant Panda to be also.

Interestingly enough, the difference in weights between the two animals did not indicate that the smaller one was deficient in nutriment; it was relatively well-padded and even carried a small amount of fat. It had never been entirely normal since its baby days, having frequent periods of loss of appetite and weight.

Trouble in the Otter Eden

When two young female Florida Otters arrived by air on October 31, General Curator Crandall's only worry was whether the large male Canada Otter in the Otter Enclosure might resent them and kill them.

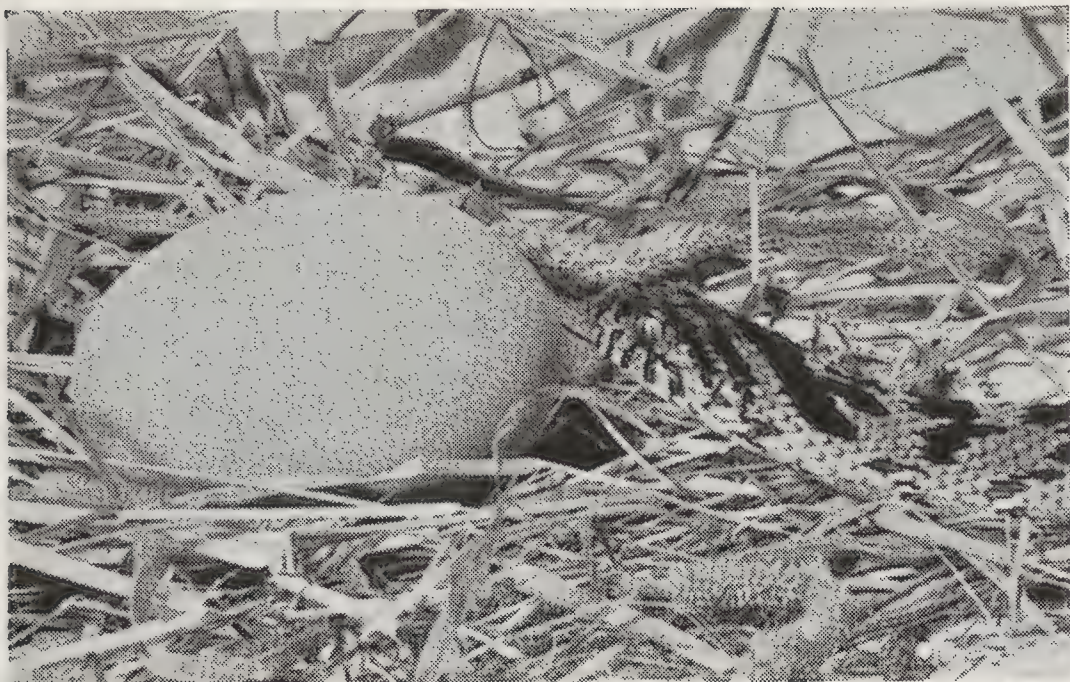
Instead, the playful females harried and chivvied the bewildered male until he had to be removed for his own protection. Now Mr. Crandall is trying to find him a mate of his own species and temperament.

PUBLICATIONS OF INTEREST

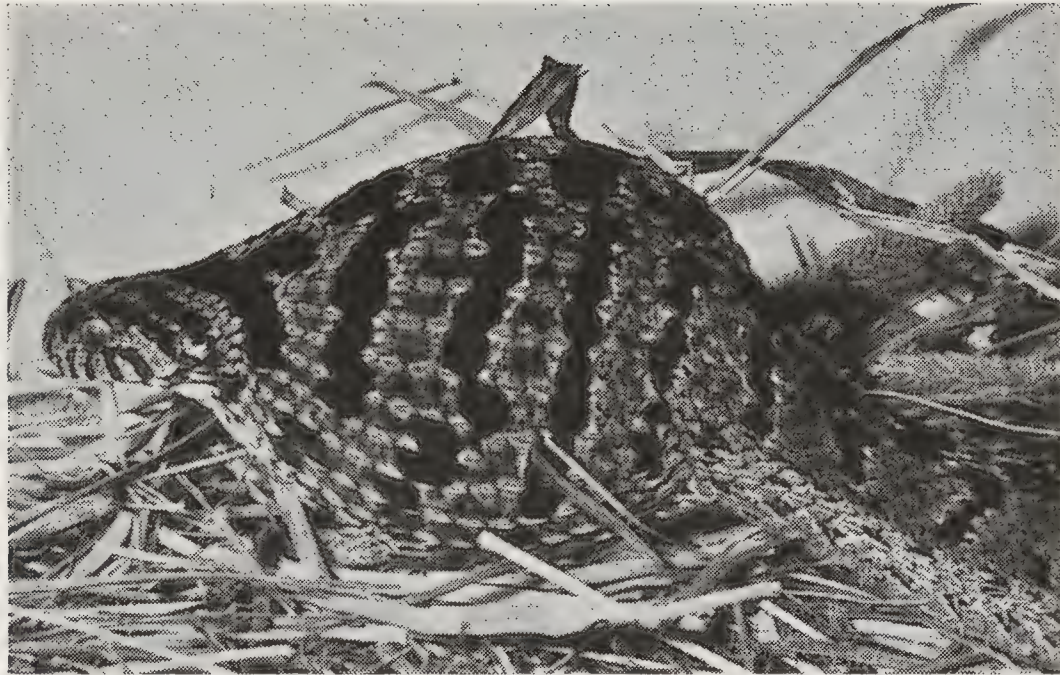
WILDWOOD WISDOM. By Ellsworth Jaeger. 491 pages, 193 plates. The Macmillan Company, New York, 1945. \$2.95.

Although this reviewer never expects to have occasion to build a fire with a drill stick, cut out a buckskin hunting shirt or contrive an Ojibway drinking cup out of birchbark, he confesses himself positively fascinated by the "how-to-do-it" illustrations and the easy, informative text of "Wildwood Wisdom." Next to being a 14-year-old Boy Scout again, this is just about tops in armchair enjoyment of the out of doors.

Mr. Jaeger is Curator of Education in the Buffalo Museum of Science, a very lively organization. Presumably he has tried out all the hundreds of ways of getting along in the wild that he describes so authoritatively, for he is reported to have spent many summers with the Indians in the United States and Canada.



1. Inspecting the "prey."



5. The cutting processes start.



2. The jaws start to expand.



6. The egg has collapsed.



3. Almost half-way there.



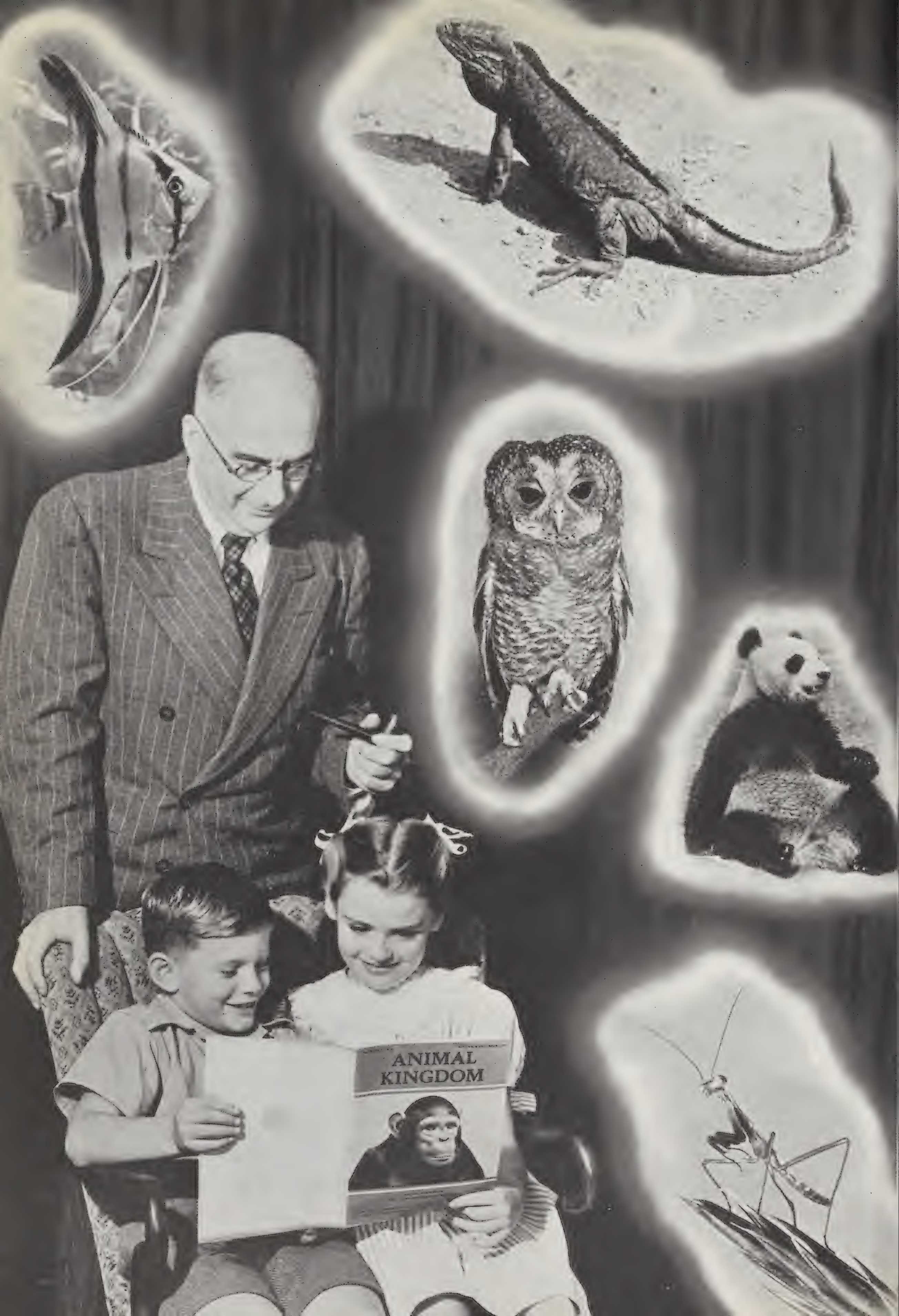
7. The shell is regurgitated.



4. On the home stretch.



8. What is left of the shell.



You Can Make Christmas Last All Year

THIS WILL BE a merrier Christmas for most of us this season — the merriest in four long years. How can we make its spirit last?

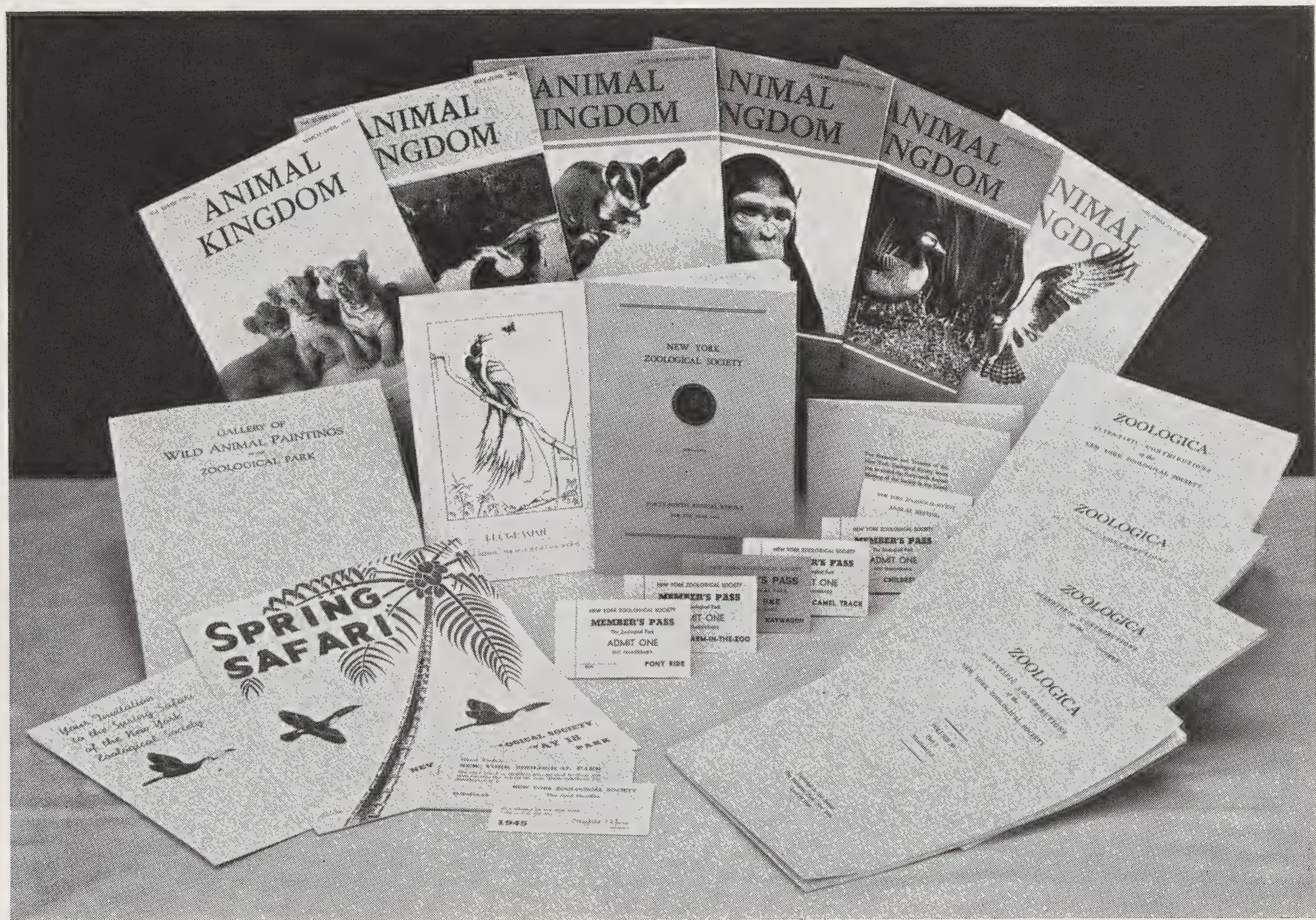
The gift of a Membership in the New York Zoological Society continues all the way to December, 1946, and carries pleasure to the entire family of the recipient. A Membership is not only a lasting gift, but it is a different kind of present — an original, and thoughtful remembrance that brings entertainment and, at the same time, great beauty and instruction.

Think of Society Membership as a gift not only for children — ideal as it is for little people. So many older people will enjoy it, too. The invalid who loves nature but can no longer seek her will find satisfaction in the many publica-

tions which come with membership. Soldiers and sailors home from years in strange, out-of-the-way spots, will discover in membership a helpful means toward rehabilitation. Ex-service men and women throng the Park daily, and many are joining the Society.

Almost anyone you can think of will benefit from an association with the Society and its fine aims.

And such an easy present to purchase! No shopping, no fuss with ribbons and tissue paper! No worrying about delivery! All you need do is fill in the inserted form in this issue, mail with your cheque or money-order, and an appropriate announcement will go to each new member in time to slip into his Christmas stocking.



Here's What You Get

Six animal-picture-packed issues of **ANIMAL KINGDOM**.

A brochure of gravure reproductions of wild animal paintings

Member's Card for free admission to the Zoo

The Society's illustrated Annual Report
A book of Guest Tickets to the Zoo

Free tickets to Children's Zoo, animal rides, etc.

Invitations to the Spring Garden Party at the Zoo

Invitations to the Annual Meeting at the Waldorf-Astoria

Zoologica, the technical quarterly (if you are a scientist)

These Are SOME of the New Members of the Zoological Society

Unfortunately, the forms of *ANIMAL KINGDOM* have to be closed almost two weeks before the magazine goes to press and it is impossible to insert the names of all the new members of the New York Zoological Society since the September-October issue. Members received too late for this issue will be reported in subsequent issues.

Life

Paul E. Geier
Walter S. Gifford
E. J. L. Hallstrom
Mrs. Paul Moore

John J. Raskob
Mrs. Beverly R. Robinson
William Jay Schieffelin, Jr.

Grant G. Simmons
Henry Trefflich
Mrs. Catherine B. Van Bomel

Annual

John C. Adams
Mrs. Ernest R. Adee
Alfred A. Alsleben
Alfred Angrist, M.D.
Percy Laurance Bailey, Jr.
Roger N. Baldwin
S. L. M. Barlow
Henry L. Beadel
George J. Beal
Sidney B. Becker
G. Campbell Becket
Herman Belth
Elliot S. Benedict
Irl. E. Bennett
Robert W. Bennett
Quincy Bent
William E. Bettridge
Frederick T. Bonham
Albert Greene Borden
Miss Lucrezia Bori
Helen E. Brice
Irving Burten
Sidney C. Carpenter
William M. Carpenter
Miss Susan Chase
Mrs. Knight D. Cheney
William H. Cole
J. Linzee Coolidge
R. N. Cranford
Percy L. Crosby
Thomas M. DeBevoise
J. William Decker
Miguel Alvarez del Toro
Anna George deMille
Adine D'Humy
John R. Dillon
Walter Douglas
Cecile de Rothschild
Irene duPont
Lammot duPont
F. Eberstadt
George Gordon Edwards
Robert D. Elder
John S. Ellsworth, Sr.
Edith Helen Feild
Marion N. Fisher
Russell S. Fowler, M.D.

Mrs. L. J. Francke
Karl T. Frederick
Albert Fried
Mrs. Jane C. Frost
W. F. Fuerst
J. H. Gambrill, Jr.
Raymond E. Gates, Jr.
R. E. Gettys
Dr. Robert Good
Albert H. Gordon
Major Chapman Grant
Ralph W. Gwinn
N. Penrose Hallowell
Mrs. Hiram J. Hays
E. Newton Harvey
Dexter C. Hawkins
Elizabeth L. Hewins
Frederick W. Hinkle
Frithjof Holmboe
Mrs. Lydig Hoyt
Richard L. Hubbard
John E. N. Hume
Miss Victoria Ives
D. H. James
Mrs. Henry James
George E. Kahrs
William F. Keller
William L. Kleitz
Nada Kramar
A. D. Lane
Mrs. M. E. Leach
Henry M. Lester
Willy Levy
Jerome Lewine
Eugene P. Locke
Howard A. Loeb
Mrs. William E. Louttit
Samuel D. Lunt
David H. McAlpin, Jr.
Miss Lorna McAlpin
Mrs. George McAneny
Miss M. B. Montgomery
W. D. Nelson
Mrs. George Nichols
Robert C. O'Connor
B. C. Ohlandt

Ralph L. Phelps
Carl A. Pitha
Arthur Raphael
John H. Ray
Jack Raymon
Gordon S. Rentschler
C. P. Rhoads, M.D.
Mrs. W. W. Rindlaub
Louis Leonard Roman
Miss Thora Scott Ronalds
Charles C. Rumsey
Miss Elise E. Sage
Donald Stuart Sammis
William J. Schaldach
George L. Schrader
Robert R. Scofield
Frank A. Shailer
Moses Shapiro
Dorothy D. Sheldon
Francis M. Smith
Mrs. H. M. Spandau
Mrs. Elizabeth R. Starret
Mrs. H. B. Steffanson
Percy M. Stewart
A. C. Stimson
Mrs. Arthur Hays Sulzberger
Dr. Carl Fulton Sulzberger
Henry K. Svenson
Robert T. Swaine
Harold H. Swift
Walbridge S. Taft
J. Alden Talbot
John D. Thees
Max Tick
Ralph Van Buren
Domenick A. Vota
Miss Dorothy Wagstaff
Thomas J. Watson
Warren Weaver
Julius Weber
M. Weisbuch
Edwin L. Weisl, Sr.
Melzar M. Whittlesey
Walter J. Williams
F. G. Wood, Jr.
Ernest L. Woodward
Simon Zive

INDEX

Figures in **black type** indicate that the reference is, or includes, an illustration, map or design.

A

- African Plains, **58, 60**, 58-61, **122**
 Agouti, Central American, birth of, 56
 "Amphibians and Reptiles of the Chicago Area," reviewed, 56
 Ant, Carpenter, **115**
 Aquarium, new, 124, **125**
 Armadillo, giant, **134**
Astronotus ocellatus, 66

B

- Baby animals, 83, **138-140**
 Bagworm, cocoon of, **177**
 Bee, Large Carpenter, **114**
 Rhode Island apiary, **63**
 tree, **141-145**
 Beebe, William, 3, 7
 "The Humor and Myth of Linnaeus," 51
 "We Carry the Society into the Jungle," 152-157
 letter from, 87, 88
 review of "The Family Anatidae," 119, 120
 translation of "The Oldest Zoological Park in North America," 14-16
 Beetle, Black Carpet, **113**
 Elm Borer, **179**
 Leaf, **113**
 Horned Passalus, **179**
 tropical, **156**
 "Birds of the Southwest Pacific," reviewed, 24
 Blackbuck, Indian, birth of, 55
 Black lambs, in Children's Zoo, 86, 87
 Blowfish, 182-186
 Bongo, **132**
 Brice, Major Richard T., **43**
 "Birds Among the Coconuts," 32-43
 Bridges, William, "Problem of the Invisible Baby Fish," 82
 "The Rare, the Strange, and the Beautiful," 126-134
 Bushmaster, **18**
 Butterfly, Monarch, **64**
 Morpho, **154**

C

- Campo, Dr. Rafael Martin del, "The Oldest Zoological Park in North America," 14-16
 Capuchin, **157**
 Carlisle, Donald T., "Live Organizations Are the Most Fun," 104, 105
 "Another Great Plan for This Society's Future," 146-148
 Caterpillar, Banded Woolly Bear, **181**
 Eastern Tent, **178**

- Cephalopterus ornatus glabricollis*, display of, 109, **110-112**
 Cichlid, Velvet, 66
 Children's Zoo, 86, 87, **138, 139**
 reopening of, 53
 Clark, H. Huber, photograph by, **30**
 Coates, Christopher W., 82
 "Multiple Uxoricide; or, the Two-inch Bluebeard," 103, 104
 Cock-of-the-Rock, Eastern, **107**
 Collembolids, **101**
 Concepcion Zoo, 84
 Conservation, 125, 168, 169
 Coral Snake, Southern, 17
 Cordier, Charles, 67, 109
 Crandall, Lee S., "A Kangaroo Record," 24
 "Pete Is the Dean Now," 24
 review of "Birds of the Southwest Pacific," 24
 "News from the Nursery," 26-31
 gloss on "Birds Among the Coconuts," 32-43
 "Four Years of Africa-in-the-Bronx," 58-61
 "A Brilliant Flash — That's the Manakin's Display," 67-69
 "Now We Have a Plethora of Black Lambs," 86, 87
 "The Umbrella Bird Is Not a Dull Fellow Any More," 109-112
 "Gray-lag, Ancestor of the Geese that Saved Rome," 116
 "We Have Two of the Rarest Chicks in the World," 119
 "Our First Baby Gibbon Is Born and Seems to be Doing Well," 158, 159
 "Family Affairs on Gibbon Island," 164-167
 Crane, Jocelyn, "Shopping for a Jungle," 2-13
 Crane, Wattled, chick of, 119
 Cricket, Field, **181**

D

- Davall, Grace H., review of "Raymond L. Ditmars," 56
 "The Key to Question House," 70-74
 Delacour, Jean, 84, 106, 119, 187
 "Perspective on the Zoological Society," 135-137
Diodon hystrix, **186**
 Dochez, Dr. A. Raymond, 119
 Dunton, Sam, 60

E

- Eddy, Brayton, **63**
 appointment of, 52
 "Insects Are Animals," 62-66
 "Mamba, Cobra and Pythons

- Arrive from Africa," 85
 "People Are Curious About Insects," 113-115
 "Presenting — Bees and a Bee Tree," 141-145
 "Let's Take a Look at Insects in Winter," 176-181
 Eel, Electric, new exhibit, **160**
 Ettinger, Hattie, "It Died a Scarlet Ibis," 48-50

F

- Farm-in-the-Zoo, 90-98
 donors of livestock, 98
 illustrated, **90-93, 95-98**
 reopening of, 53, 55
 Fer-de-lance, **19, 20**
 Flamingo, Chilean, 49
 Roseate, 49

G

- Garden Party, 83
 Gibbon, White-handed, 164-167
 baby, 158, **159, 166**
 drinking, **164**
 Goose, Blue, nesting of, 86
 Gray Lag, 116, **Cover No. 4**
 Gordon, Myron, "A Swellfish Story," 182-186
 Goss, Leonard J., "The Farm-in-the-Zoo Appeals to City Folk," 90-98
 Griffin, Sergt. John, drawings by, **33, 37, 41**
 Grosbeak, Pine, visits Zoo, 55
Guara rubra, 48-50

H

- Hansen, Staff Sergt. Robert, citation of, 187
 Harris, Hayden B., donor of gibbons, 165
 Hein, Capt. Albert F., citation of, 117
Hemichromis bimaculatus, **82**
 Hess, Lilo, photographs by, **164, 166**
 Hippopotamus, Nile, longevity of, 24, 116
 Howes, Paul Griswold, "A Jungle Pigmy," 99-102
 Hummingbird, Violet-eared, nesting of, 52, 88

I

- Ibis, Scarlet, coloration, 48-50
 Insects, 62-66
 numbers of, 62, 63
 survival of, 62

J

- Jackson, Earl, "About Bull Snakes," 75-79
 Jackson Hole, 168, **169**
 Jararacussu, **21**

Jewelfish, Ruby, **82**, 103, 104
 Jewel Room, **106-108**
 "Judy at the Zoo," reviewed, 120

K

Kalmenoff, Matthew, paintings by, **122, 125**
 Kangaroo, Great Gray, longevity of, 24
 Red, longevity of, 24
 Koala, **127**

L

Lachesis muta, **18**
 Ladybeetle, Two-spotted, **181**
Lampropeltis getulus californiae, 76
 Leopard, Black, cub, **31**
Leucochloridium paradoxum, 61
 Lion cubs, 26-31, 52
 death of cub, 85
 Lion, Tiger cubs, **Cover No. 2**
 Locust, Seven-year, **65**
 Longevity, records of, 24

M

Macrurus frontalis, 17
 "Mammals of the Pacific World," reviewed, 88
 Manakin, Yellow-thighed, 67-69
 display of, 67, **68, 69**
 Martini, Mrs. Fred, **26, 29**, 26-31
 Mayr, Dr. Ernst, 119
 Membership, "Why Should I Join the Zoological Society?" 80-81
 "Live' Organizations Are the Most Fun," 104, 105
 "Another Great Plan for This Society's Future," 146-148
 "You Can Make Christmas Last All Year," 190-192
 Member's Room, Zoological Park, **147**
 Menagerie, Central Park, 24
Microstigmus guianensis, 99-102
 nest of, 100, 102
 on nest, 99
 Miller, Nelson, 91
 Moth, Cecropia, cocoon of, **178**
 Indian Meal, **114**
 Webbing Clothes, **114**
 Mynah, Rothschild's, **107**
 Myth, poster on, **81**

N

"Native Peoples of the Pacific World," reviewed, 160
 Nigrelli, Ross F., "The Subtlety of *Leucochloridium paradoxum*," 61
 Nyala, **60**

O

Okapi, **129**
 Osborn, Fairfield, 84
 Editorial, "The Society and Conservation," 1
 "Our New Department of Insects," 25
 "Forest Destruction and Wildlife," 57
 "Question House," 89
 "The Purpose of This

Society," 121

"We Must Reverse the Tide," 163

Foreword to "Shopping for a Jungle," 3

"The Department of Insects at the Zoological Park," 52

"The Significant Future of the Zoological Society," 122-125

"The Zoological Society Is Going to Wyoming," 168, 169

Osprey, coming in to nest, **Cover No. 5**

Otter, new exhibit, **117, 188**

P

Panda, Giant, **133**
 death of, 188

Pelican, European, age of, 24

Penguin, Blackfoot, "Annie," 55

Phalanger, New Guinea Short-headed Flying, **Cover No. 1**

Phoenicopterus chilensis, 49
ruber, 49

Picture Sheet, 187

Pipra mentalis, 67-69

display of, **68, 69**

Pituophis sayi affinis, 75-79, **76, 79**

Pit-viper, Godman's, **46**

Hog-nosed, **46**

Jumping, **23**

Maximilian's, 17, **22**

Patagonian, 17

Platypus, Duck-billed, **131**

Poisoning, Snake, treatment of, 18-23

Pope, Clifford H., "The Poisonous Snakes of the New World. Part 4," 17-23

Part 5, 44-47

Porcupine fish, **186**

Porter, Eliot, 148

photograph by, **Cover No. 5**

Puffer, 182-186

Q

Question House, 70, 89, **118**

R

Rainey Gate, birds in, 118, 119

Rancho Grande, **2, 4, 5, 11, 13**, 87, 88, 152-157, 170-175

view from roof, **153**

"Raymond L. Ditmars," reviewed, 56

Rimmer, Keeper James, 24

Ruhe, Louis, 24

S

San Francisco Zoo, 158

Sapajou, **54**

Sciurus saltuensis bondae, 187

Scott, Keeper George, 187

Sealions, California, pool repainted, 187

Skunk, "Petunia," **Cover No. 3**

Snail, host for *Leucochloridium paradoxum*, 61

Snakes, arrivals from Africa, 85

Snake, Bull, 75-79, **76, 79**

California King, 76

Egg-eating, **188, 189**

poisoning, treatment of, 44-47

Solenodon, Haitian, **128**

Sparrow, host for *Leucochloridium paradoxum*, 61

Sphaeroides maculatus, 182, **183, 184**

Spider, Black Widow, 66, **85**

Grass, **179**

Squirrel, and buried nut, 53

Colombian Red-bellied, 187

St. Louis Zoo, Bird House in, **49**

Swan, Trumpeter, status of, 187

Swanson, George Alan, "Jungle Studio," 170-175

drawings by, **14, Cover No. 6, 170-175**

T

Tanager, Yellow-fronted Green, **108**

Tee-Van, John, review of "Amphibians and Reptiles of the Chicago Area," 56

"We Aid the San Francisco Zoo in Planning Development," 158

Termite, **115**

Tetons, Grand, **169**

Tetraodon fahaka, **185**

fluviatilis, 186

Tetraodontoxin, 182

"They All Saw It," reviewed, 120

Thrush, Hermit, 83

Thylacine, **130**

Tiger Cub, 26-31, 52

Trimeresurus alternatus, **21**

ammodytoides, 17

atrox, **19, 20**

godmani, **46**

jararacussu, **21**

nasutus, **46**

neuwiedii meridionalis, 17, **22**

nigroviridis marchi, **45**

nummifer, **23**

schlegelii, **45**

U

Umbrella Bird, display of, 109, **110-112**

Urutu, 17, **21**

V

Viper, March's Palm, **45**

Schlegel's Palm, **45**

W

Wasp, Tiny Purse, 99-102

Wildlife Refuges, in France, 84

"Wildwood Wisdom," reviewed, 188

Y

Ylla, 120

Z

Zebra, on African Plains, 59

Zoological Garden, San Francisco, 158

Zoological Park, National, 24

Zoological Park, New York, scenes in, **149-151**

A REPORT OF PROGRESS AND OUR THANKS

THE ZOOLOGICAL SOCIETY has made great advances in the year behind us. We have gained in many ways. One of our great gains has been in our membership—the biggest increase in membership in any year of our entire history! An increase of well over 50% at the time we go to press—quite early in November!

While this progress is reassuring in the extreme, we are still anxious to recruit everyone with an interest in the great objectives ahead of us.

May it be suggested that a membership in the Society is an exceedingly appropriate Christmas gift for almost anyone—young or old? Throughout the year, it gives a wholesome stimulation to the mind of youth. From month to month, it fortifies the serenity of adults.

Our great thanks to so many of our members for their valuable help in our membership campaign!

Our best wishes to all of you for 1946!

Fairfield Osborn

President

The New York Zoological Society

530.673

.A59

ANIMAL KINGDOM

NEW YORK ZOOLOGICAL SOCIETY



VOLUME XLIX

JANUARY TO DECEMBER, 1946

NUMBERS 1-6



INSTRUCTIONS TO BINDER

The 4-page signature forming the first 2 and the last 2 pages of this issue may be inserted ahead of the cover of Vol. XLIX, No. 1, in binding the volume.

CONTENTS

No. 1. JANUARY-FEBRUARY

"Half Centuries"	<i>Fairfield Osborn</i>	4
This Is the Way We Began	<i>Donald T. Carlisle</i>	8
The Life of the Waters	<i>Christopher W. Coates</i>	11
Roads to Research	<i>Leonard J. Goss</i>	15
With a Roving Commission	<i>William Beebe</i>	18
Colorful Pages from the Past		23
Conservation of Wildlife	<i>Fairfield Osborn</i>	31
Into Some Queer Corners	<i>William Bridges</i>	35
Telling the World	<i>Myrtice Blatchley</i>	38
Reading and Writing	<i>William Bridges</i>	42
In the Medium of Oils	<i>John Tee-Van</i>	43
An Approach Through the Sportsman	<i>John Tee-Van</i>	45
Fun in the Zoo	<i>Lee S. Crandall</i>	46
New Ways to Old Ends	<i>Fairfield Osborn</i>	49

No. 2. MARCH-APRIL

It was Rugged for Wildlife, Too	<i>Ira N. Gabrielson</i>	55
What Will the Atomic Bomb Do to Wildlife?		59
Bringing Up Benny	<i>Lee S. Crandall</i>	61
Footnote to Darwin	<i>Myron Gordon</i>	65
Newcomers from the Gold Coast	<i>Brayton Eddy</i>	68
The Carefree Life of a Baby Gibbon		70
The Electric Eel Went to War	<i>William Bridges</i>	73
An M.D. Looks at Conservation — and the Zoological Society	<i>Alan Gregg</i>	76
Petunia and Jeffrey Visit School		79
That's What We're Here For!	<i>Donald T. Carlisle</i>	82
Behind the Scenes: News and Notes		84

No. 3. MAY-JUNE

Giants in Armor	<i>Brayton Eddy</i>	91
A Rare Bird Walks Again	<i>Leonard J. Goss</i>	95
The Bats of Carlsbad Caverns	<i>Ernst Christensen</i>	98
The Sentimental Approach	<i>William Bridges</i>	104
A Curious Display Form of a Curious Bird	<i>Lee S. Crandall</i>	108
Pumps Are a Problem, Too	<i>Christopher W. Coates</i>	111
Around the Zoo With the Headkeeper of Mammals	<i>William Bridges</i>	113
Behind the Scene: News and Notes		117

No. 4. JULY-AUGUST

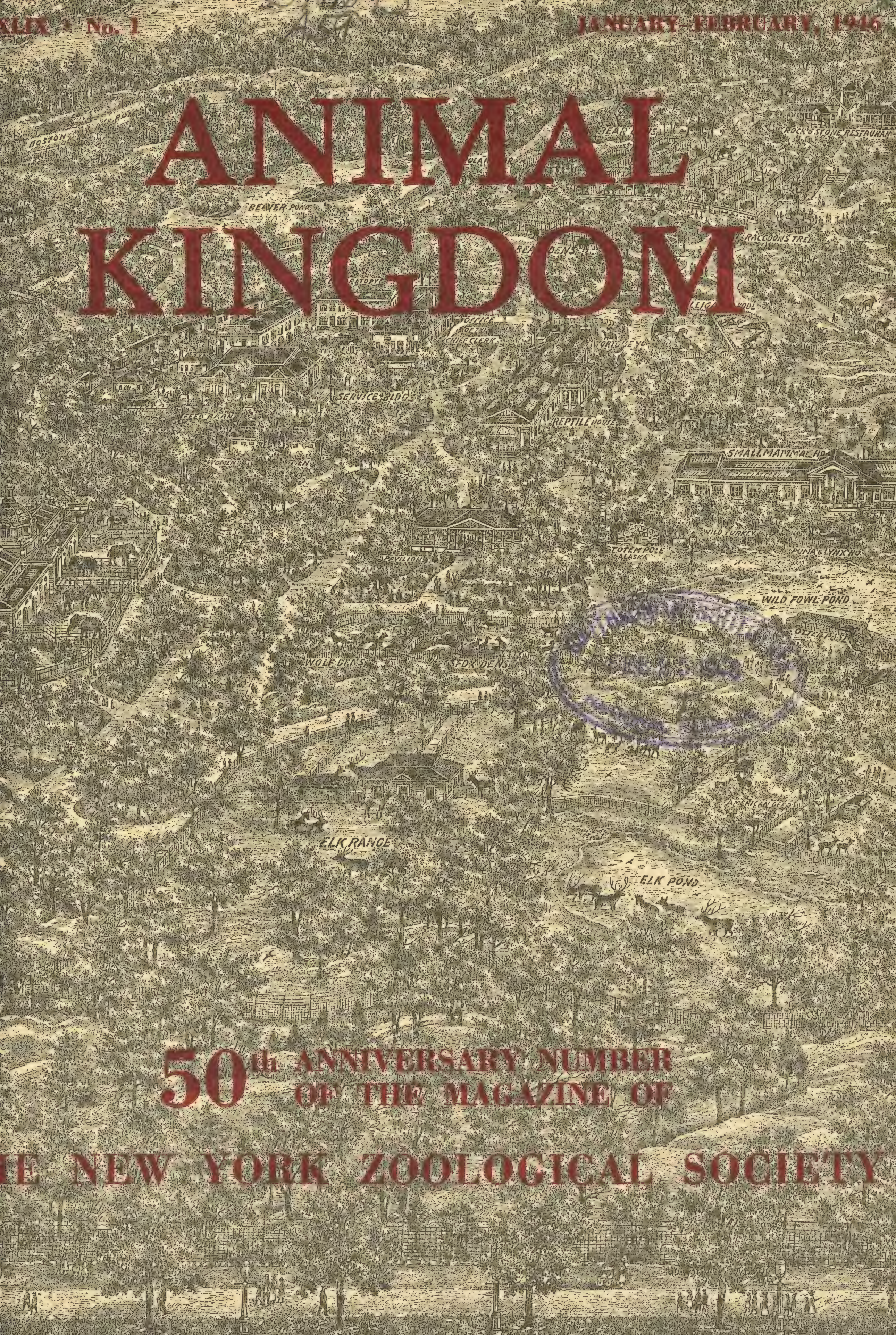
New Animals Are Coming to the Zoo	<i>Lee S. Crandall</i>	122
The Bounty System Doesn't Work	<i>W. J. Hamilton, Jr.</i>	130
Camera Close Ups	<i>Brayton Eddy</i>	139
Even the Walls Answer Questions		144
An Open Letter to Our Members	<i>Donald T. Carlisle</i>	146
An Artist Looks at the Zoo	<i>Cornelia Van A. Chapin, N.A.</i>	149
Tiny Killer	<i>Christopher W. Coates</i>	152
Behind the Scene: News and Notes		154

No. 5. SEPTEMBER-OCTOBER

Newsletter: The Belgian Congo's Gift to the New York Zoological Society	<i>William Bridges</i>	158
Five Ways of Obtaining Animals	<i>Lee S. Crandall</i>	165
Lord of the Northern Trails	<i>Ben East</i>	171
Bird Housekeeping		177
An Expedition Your Friends Will Wish to Join	<i>Donald T. Carlisle</i>	181
The Last of a Species	<i>William Bridges</i>	183
Behind the Scene: News and Notes		187

No. 6. NOVEMBER-DECEMBER

Trustees of Friendship	<i>Donald T. Carlisle</i>	191
The Great Gray Frog of Rancho Grande	<i>William Beebe</i>	193
How to Weigh a Gorilla	<i>William Bridges</i>	200
Fish Do Come Back	<i>Ben East</i>	204
42½ Years of Gardening in the Zoological Park	<i>George Skene</i>	211
Behind the Scenes: News and Notes		217
Index to Volume XLIX		219



ANIMAL KINGDOM

50th ANNIVERSARY NUMBER
OF THE MAGAZINE OF

THE NEW YORK ZOOLOGICAL SOCIETY

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York 20, N. Y.

PRESIDENT
Fairfield Osborn

FIRST VICE-PRESIDENT
Alfred Ely

SECOND VICE-PRESIDENT
Laurance S. Rockefeller

SECRETARY
Harold J. O'Connell

TREASURER
Cornelius R. Agnew

EXECUTIVE COMMITTEE
Laurance S. Rockefeller, *Chairman*

Cornelius R. Agnew
Alfred Ely
De Forest Grant

Warren Kinney
William De Forest Manice

David H. McAlpin
Robert Moses

Harold J. O'Connell
Fairfield Osborn
J. Watson Webb

BOARD OF TRUSTEES

Class of 1947

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez

De Forest Grant
Eugene Holman
Warren Kinney

Henry R. Luce
William De Forest Manice
Harold J. O'Connell

Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1948

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely

Marshall Field
Childs Frick
Archer M. Huntington

David H. McAlpin
John H. H. Phipps

Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Class of 1949

George C. Clark
F. Trubee Davison

Jay Downer
Robert I. Gannon

Robert Gordon McKay
Fairfield Osborn

Laurance S. Rockefeller
John M. Schiff
Frederic C. Walcott

Ex-Officio, The City of New York

The Mayor, Hon. William O'Dwyer

Commissioner of Parks, Hon. Robert Moses

STAFF

GENERAL

John Tee-Van *Executive Secretary*
Jean Delacour *Technical Adviser* Sanford Miles *Comptroller*
William Bridges . . . *Editor & Curator, Publications* Sam Dunton *Photographer*
Myrtice A. Blatchley . . . *Associate in Charge, Department of Education*

ZOOLOGICAL PARK

Lee S. Crandall *General Curator*
Brayton Eddy . . . *Curator of Reptiles & Insects* Leonard J. Goss *Veterinarian*
Edward Kearney . . . *Manager, Facilities Dept.* Grace Davall . . . *Assistant to General Curator*
Quentin Melling Schubert, *Superintendent, Construction and Maintenance*
W. Reid Blair *Director Emeritus* William Beebe *Honorary Curator, Birds*

AQUARIUM

Christopher W. Coates . . *Curator and Aquarist* C. M. Breder, Jr. . *Research Associate in Ichthyology*
Ross F. Nigrelli *Pathologist* George M. Smith . *Research Associate in Pathology*
Myron Gordon *Assistant Curator* Homer W. Smith . *Research Associate in Physiology*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*
Jocelyn Crane *Research Zoologist* Henry Fleming *Entomologist*

Associates

William K. Gregory
John Tee-Van

Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

Vol. XLIX FEBRUARY 21, 1946 No. 1

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York 20, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York 60, N. Y. Title registered with United States Patent Office.

Subscription, \$2.50 a year; single copy, 50 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

FOREWORD

MOST INSTITUTIONS have an urge to look backward when they reach a half-century mark. It is a time to fête the oldest living members, to bring out old scrapbooks and faded photographs, to smile at the struggles of early days.

It has been almost impossible to make the staff of the New York Zoological Society look backward. Such reminiscences as we have been able to gather for this Golden Anniversary number of *ANIMAL KINGDOM* have, for the most part, turned into springboards for a leap into the future.

In truth, the future is incomparably more exciting and more interesting. We are picking up momentum; a powerful surge forward is starting. We are working out new realizations of the Zoological Society's meaning and value. The next few years promise great striving and great achievement, and it is no wonder if our eyes are alight.

But the founders struggled and achieved great things fifty years ago, too, and the Society can feel a warm kinship with them, as it looks back a little — and ahead a great deal — in the special articles that follow.

IN THIS ISSUE

An Old Map of the Zoological Park (1911)	Cover
"Half Centuries"	Fairfield Osborn 4
This Is the Way We Began	Donald T. Carlisle 8
The Life of the Waters	Christopher W. Coates 11
Roads to Research	Leonard J. Goss 15
With a Roving Commission	William Beebe 18
Colorful Pages from the Past	23
Conservation of Wildlife	Fairfield Osborn 31
Into Some Queer Corners	William Bridges 35
Telling the World	Myrtice Blatchley 38
Reading and Writing	William Bridges 42
In the Medium of Oils	John Tee-Van 43
An Approach Through the Sportsman	John Tee-Van 45
Fun in the Zoo	Lee S. Crandall 46
New Ways to Old Ends	Fairfield Osborn 49



Some of the Two Thousand Members and Friends of

IT WAS ten minutes before midnight on the evening of January 8 when the last guest departed from the ballroom of the Waldorf-Astoria and the New York Zoological Society's Golden Anniversary Meeting was officially over.

It was, surely, the longest meeting in our his-

tory — packed with memories of the past, forecasts of the future, reports on the exciting present. The membership heard President Osborn's "key-note" of the half century ahead; Dr. Alan Gregg's pungent observations on our work in Conservation; Dr. John S. Nicholas on our research poten-



Zoological Society at Our Golden Anniversary Meeting

tialities; sprightly John Kieran on our general behavior. It exclaimed at the beauty of tropical creatures in Dr. Beebe's color film, at the lively new ideas and current happenings at the Zoological Park as pictured in color, at the extraordinary wing beats of Hummingbirds portrayed in ultra

slow motion. And then, after the business and "entertainment" portions of the program, it still lingered, reluctant to leave the dramatic demonstrations of Electric Eel discharges, the jewel-like tropical birds, the glittering fishes, the pictured history of half a century's accomplishments.

“HALF CENTURIES”

An Informal Report to the Membership on the Occasion of the Fiftieth Annual Meeting

by

FAIRFIELD OSBORN

President of the New York Zoological Society

LITTLE could the founders of the Zoological Society have foreseen, in 1895, the success of this enterprise. But they builded soundly and with vision, formulating a charter that continues to be the guiding star for all of our various activities today. A year or two later, needing a place to live and work, they, almost like pioneers, took out a “homestead” in the Bronx, at that time out in the farming country, now well within the greater City limits — and started to build our great Zoological Park. They would not have dared to guess that between then and now, some 96,000,000 people were to pass through the gates; nor that, during the four decades of our management of the Aquarium at the Battery, more than 84,000,000 visitors would come to see the mysterious forms that live in the waters of the earth — over 180,000,000 people in all, equivalent in number to two-thirds of the total population of the Western Hemisphere.

Let me call attention to something that strikes me as a peculiarly American way of doing things. For half a century now we, a private management corporation, have been working in the public interest. We could not have done so had it not been for the cooperation and confidence that our institution has always enjoyed from the City Government, backed by very substantial public funds which have been placed in our care for physical improvements and for current opera-

tions. The success of this alliance strikes me as quite remarkable. In the years since I have been President I can assure you it has meant a great deal to our administration. I speak of this working alliance because it seems to me typical of this country of ours and something very much to be cherished.

Now, to return to the founders of our Society, while they builded to *show* the living things of the earth, they fought to *preserve* them. Those were rough-and-tumble days at the turn of the century when game-hogs roamed the land. For example, an original estimated population of 65,000,000 buffalo — they really should be called bison — had been slaughtered down to forlorn little isolated groups of less than 100 wild animals (there were a few hundred additional in captive herds); the fur-seal colonies were being decimated and every pretty and very foolish woman adorned her head with the exquisite feathers of rapidly vanishing bird life. The pattern of different circumstances and events are strangely familiar. The situation of wildlife in those days was not unlike that of our troops encircled at Bastogne in the black days of December, 1944. The men of the Zoological Society — shining names such as George Bird Grinnell, Madison Grant and William T. Hornaday — with a handful of allies, notably the Audubon group, were the spearhead that drove through and turned



Scenes in the early days of the Zoological Park and the Aquarium, and portraits of the founders and original officers of the Society, were pictured in photomurals at the Golden Anniversary Members' Meeting.

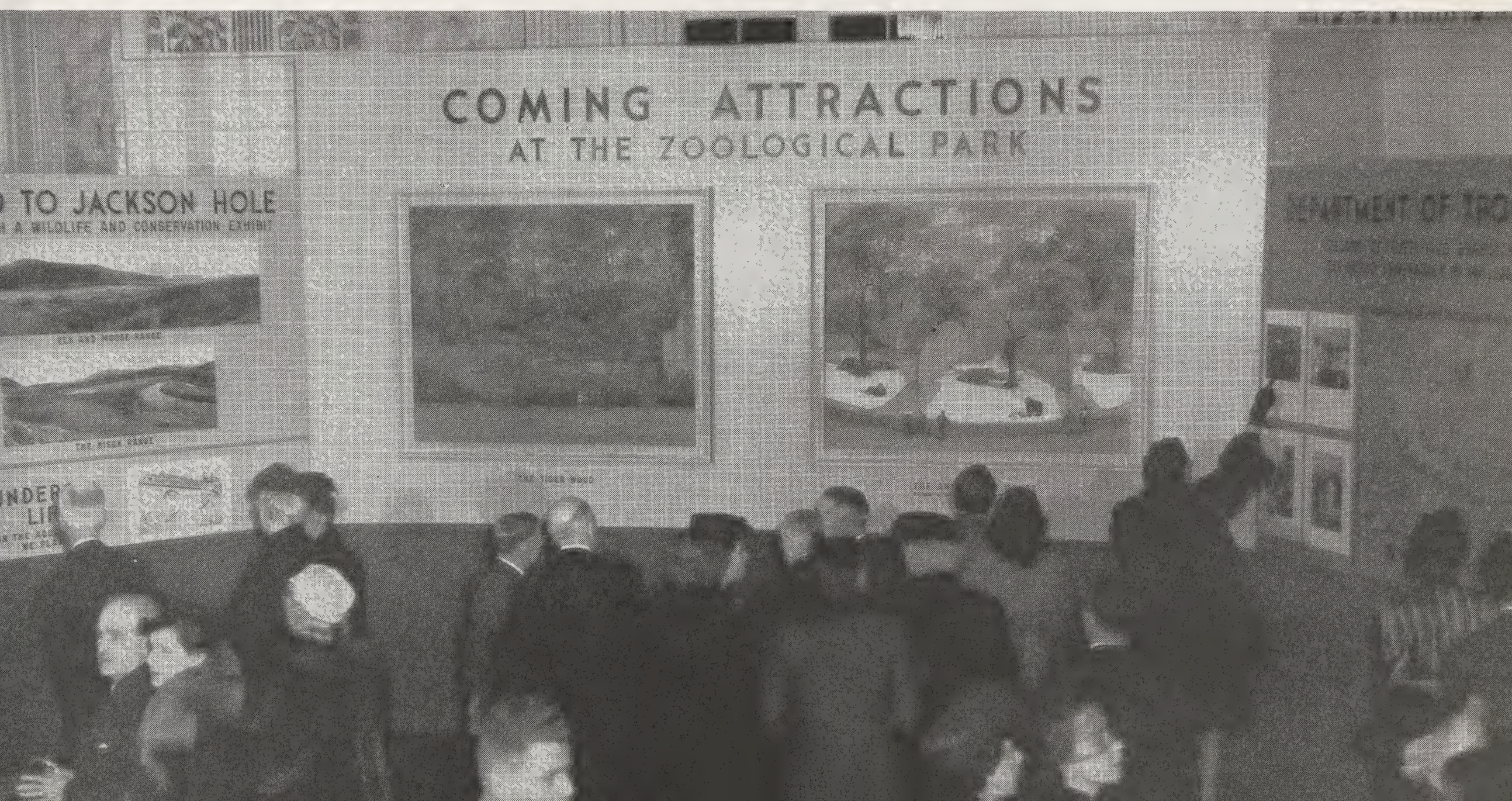
the tide. It is no exaggeration to say that the Zoological Society was to a very major degree the founder and creator of the Conservation movement in this country.

Other things within the half century — many: a tremendous output of scientific work through the years, original and of high quality, the volume very great — our technical paper *ZOOLOGICA* in its 38th year, having a distribution today to

scientific institutions in most of the countries of the world — 53 different countries in all; books for the general public on a wide variety of subjects dealing with animal life — 66 in all to date. And then the extraordinary series of expeditions — 45 in all — of the Department of Tropical Research, terrestrial and marine, under Dr. William Beebe.

The past flows through the present — on into

In contrast to the scenes from the past, panels at the opposite end of the foyer made vivid the Society's plans for the immediate future—new outdoor exhibits in the Zoological Park, conservation in Wyoming.





The Medal of Honor of the Zoological Society was conferred upon the Honorable Frederic C. Walcott (right) by President Osborn during the Annual Meeting. "Your notable career expresses, among a number of other things, the power of kindness," said Mr. Osborn. "This quality has not only governed your human relationships but, we suspect, caused you since your earliest days to take a vital interest in wildlife protection. During your term as United States Senator you championed legislation that will prove of permanent value to the cause of conservation. You have come to a position of outstanding leadership in this creative field." The Society's medal bore the inscription: "Frederic C. Walcott, humanitarian, conservationist, vigilant defender of the living things of this earth." Also during the meeting, scrolls were presented by Secretary O'Connell to six original members (before 1899) of the Zoological Society.

the future. As to our present condition, we are in tidy order, living within our income. The history of the Society has always been excellent in this respect. We have been able to make improvements and progress of a substantial nature even during the war period. Above all, I must speak of the plans that have been made for the immediate future. They are the harbingers of the half-century that lies ahead. A detailed program has been prepared that will cost upwards of \$7,000,000; in approximate figures:

\$1,500,000 to complete the modernization of the Zoo,

\$1,500,000 for the Society's share in the

construction of a great new public Aquarium,
and

\$4,000,000 for general funds, in order that we may be able to manage these larger operations, provide better pension benefits for our employees, and extend the Society's work in education, research and conservation.

Let me say this with the utmost conviction. Expansion *just to be bigger* makes no sense. We do not wish — paraphrasing the words of Gertrude Stein — "just to be big, to be bigger, to be big." The truth is that necessity as well as op-

portunity are knocking at our door. Not only must we complete the metamorphosis of the Zoo — getting the animals out from behind the bars and giving them natural environments; not only should we do everything within our power to see that this great City has a new Aquarium — always a center of nation-wide interest — but, also we need to extend our influence in the world of ideas — through literature, the radio, films — in research, the fabric from which truth is drawn, and lastly, in the vital field of conservation. For many reasons, including the concentration of populations in the cities, our mechanized and industrialized civilization, the present disturbances and aftermaths of the war, even the psychological as well as the actual threat of the misuse of atomic energy — the great mass of people have lost touch, often against their own desire, with the world of nature. Quite apart from its charm, grace, color or mystery, animal life is indeed the dynamic expression of the processes of nature. Herein is the key to our future, for there is probably no other institution here or abroad that can bridge this gap to nature for the benefit of such great numbers of people.

STEADILY and to an ever-increasing degree, we are becoming a national institution. This, heaven forbid, is not said in a spirit of boastfulness. The fact expresses itself in several ways, not only through our own physical growth but in the substantial increase in working contacts through the country. To illustrate this, next spring because of the opportunity presented by Mr. John D. Rockefeller, Jr., and through the foresight and support of one of our own trustees, Laurance Rockefeller — the Society will be taking active leadership in the creation of a Wildlife and Conservation project in Jackson Hole, Wyoming. As another illustration, we, together with some of our fine allies, the Audubon Society, the Boone & Crockett Club, the American Wildlife Institute, are formulating plans for taking sponsorship of the last remaining herd of Roosevelt Elk in northern California to memorialize the name of one of our former presidents, Madison Grant. In other ways we are extending our influence on a nation-wide basis. For example, in June of last year the municipality of San Francisco voted

\$1,000 to engage our help and services in formulating future plans for their zoological park. We have been visited within the twelve months by representatives from most of the other larger cities in the country and have shared with them fully and without reserve all our detailed plans for improvements in the future. We are working on the theory that the more we can help others, the better it is for all of us including ourselves. It is more than apparent that our opportunities are very great and far-reaching, and it is equally apparent that we cannot meet and cope with these opportunities unless we have adequate resources and staff.

LET me close by asking a question. Who can measure the ultimate values of the work of our Society? Of the labors of our staff members who, together with collaborators in other institutions, are struggling for the truth in research work — for instance, in genetics, or pathology, or in studies concerning the behaviorism of living things? Who can judge the ultimate good that may result from our educational services or from our work in conservation — the science that deals with man's life in relationship to his natural environment — conservation, the art of cooperating with Nature and not of destroying it, lest in the end we disappear in a self-made sterile and barren world? Who can appraise those intangible yet powerful values that come to a child or an adult in viewing the radiance, the symmetry, the humor even, or the mystery of living things? No one can answer these questions. All we know is that these things are good. They are somehow of our essence. They are of the great natural world from which we have sprung. They are valuable for a better understanding of our own existence and they are of use to and thirstily sought after by millions of people.

We express our great gratitude to the founders of this institution and to the men and women who have contributed to its welfare in the half-century just ending. At the same time we express confidence in the future that lies ahead and the belief that we will be able to accomplish the things that we are now setting out to do. Necessity as well as opportunity are knocking at our door.



At 3:15 o'clock on the afternoon of Wednesday, November 8, 1899, a few hundred members of the Society and city officials gathered at the Aquatic Bird House for a ceremony that officially opened the Zoological Park to the public. Prof. Henry Fairfield Osborn and President Morton spoke on behalf of the Society.

This Is the Way We Began

By DONALD T. CARLISLE

MANY A GREAT IDEA has been born before a roaring log fire. While history in this case does not record the exact moment of creation, it is a matter of fact that the spark of the idea for a New York Zoological Society was fanned to flame in the fall of 1894 at discussions held informally in the lounge of the old Boone and Crockett Club — then as now an organization of leading natural scientists, explorers and sportsmen.

Theodore Roosevelt, the father of Conservation in America, and then president of the Boone

and Crockett, led in these early explorations of the opportunities for a Zoological Society whose first purpose was to be the establishment of a worthy collection of wild animal life in New York City.

In 1894 New York had no zoological collection in keeping with the City's needs. True, a small menagerie had been maintained for some time under restricted conditions in Central Park. This however was not a great zoological park as contrasted with those of London, Berlin, Paris or many other European capitals — even as com-

pared with the collections of our sister city, Philadelphia. It was obvious upon examination that in those cities where comprehensive zoological parks were then flourishing, responsibility for their development was not vested solely with municipal administrations. Behind nearly all the best zoos of the world, zoological societies were exercising the administrative direction — planning the buildings and enclosures, selecting the animals, and forwarding other objectives fully as important as that of effective animal exhibition. Such aims as the conservation of wild life, the furtherance of biological science and the development of those educational values inherent in a great zoo are not the proper province of a municipal park system with changing political controls. They can be advanced best through non-partisan bodies such as zoological societies, free to carry forward sustained, uninterrupted cultural programs. There must be an alliance with the city, to be sure, for the park and the Society must render the broadest public service, but the directing force to be effective must be largely vested with a self-sustained and self-perpetuating organization, capable through a wide range of talents of developing all the resources within a representative zoo.

Thus into the planning of the New York Zoological Society and of the eventual park to be under its administration, came many considerations. The Society's objectives must be clearly defined in advance, and it was then necessary to secure legislative authority sufficiently broad to insure their continued effectiveness. Toward this planning went the imagination and the judgment of a singularly gifted group of men. From its earliest days the Society benefited by the great wisdom of such seasoned minds as those of Levi P. Morton, the Society's second president, and of Andrew Carnegie, founder of the Society's pension fund. However,

these older founders with their proved wisdom were balanced against the force and imagination of many younger men. Henry Fairfield Osborn, then Dean of the Faculty of Pure Science at Columbia University, was in his mid-thirties

when he took his part in the foundation of the Society. For many years Chairman of its Executive Committee, Prof. Osborn was the Society's president during the period 1909 to 1925. Madison Grant, first secretary and later president of the Society (1925-1937), was but thirty when he first sat on the Society's Board of Managers.

The best fire is made of a well-balanced blend of green and seasoned wood. It was such a blend that created the fire forging the New York Zoological Society.

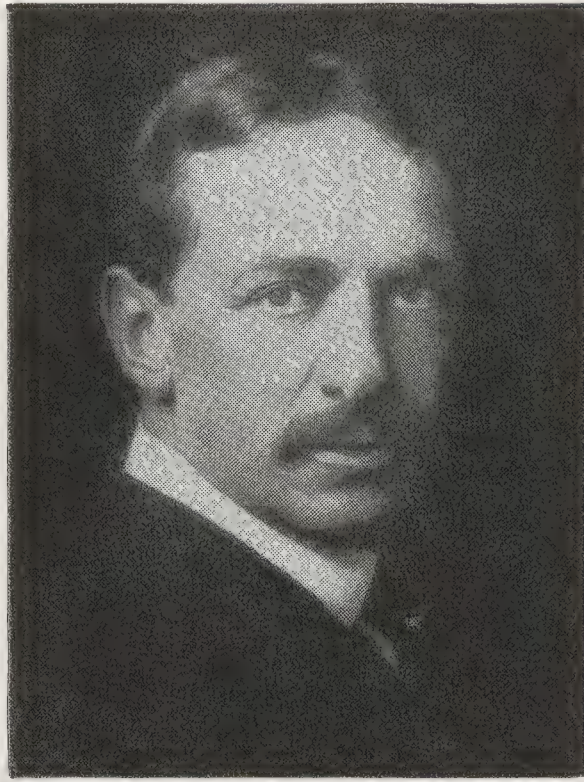
In the early spring of 1895 Theodore Roosevelt's three-man committee from the Boone and Crocket Club went to Albany with a plan and an application for a charter.

The Society's plan called first for the establishment of a free zoological park — "for the benefit and enjoyment of the general public, the zoologist, the sportsman and every lover of nature." The second objective was to be — "a systematic encouragement of interest in animal life" among all classes of people, and the promotion of zoological science in general. Thirdly, the Society was to cooperate in the preservation of native animals of North America, and to encourage the growing sentiment against their wanton destruction. These aims have been broadened with the years, but as

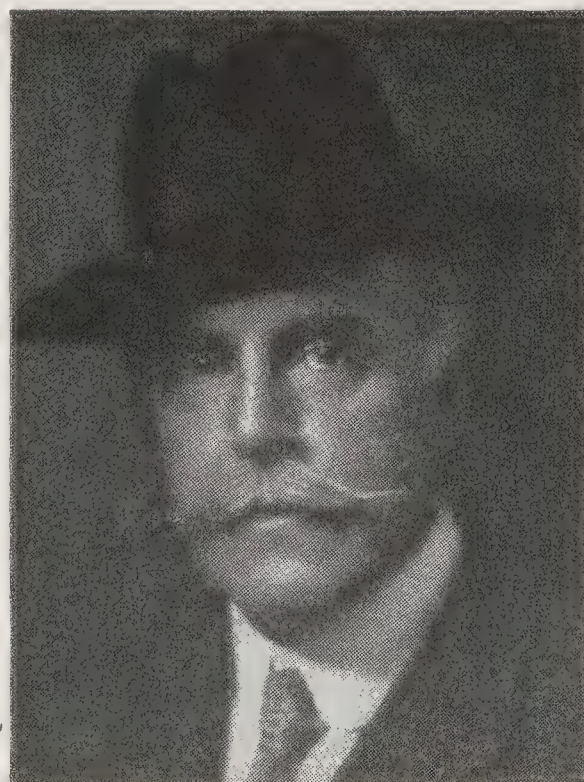
they were originally stated they are the Society's basic objectives to this day.

On April 26, 1895, was passed the legislation necessary "to incorporate the New York Zoological Society and to provide for the establishment of a zoological garden in the City of New York."

Between that day when the New York Zoological Society was legally created and the raw after-



HENRY FAIRFIELD OSBORN
President, 1909-1925



MADISON GRANT
President, 1925-1937

noon in November, 1899, when the Park was publicly opened, lay many months of thought and labor. The founding fathers were faced with complex problems. Where should the park be located? How should it be laid out? Who would direct the work? Above all, where was the money necessary for the initial project, since the Society in its agreement with the City had pledged the availability of \$250,000 for buildings and animals before the young organization was to enter fully into occupation of the park?

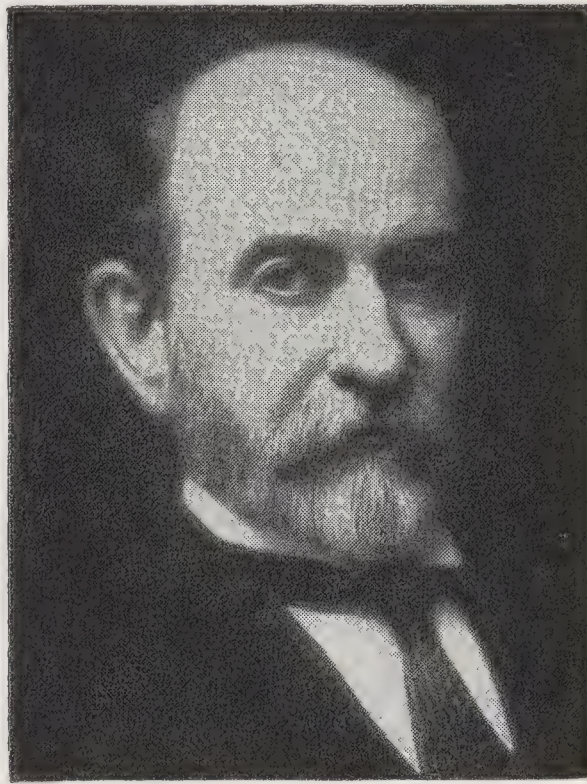
Accepting its responsibilities in their logical order, the first Executive Committee of the Society sought a Director for the park whose initial duty, following a study of the park sites then available, was to be a survey of the best European zoological gardens. William T. Hornaday was appointed Director on April 1, 1896, and began at once an "exhaustive study" of the various park locations possible. The solution seems to have been a simple one for in little more than seven weeks after Mr. Hornaday's appointment, the Society made formal application to the Commissioners of the Sinking

Fund for the grant of 261 acres in South Bronx Park. It is assumed that Mr. Hornaday began preparations at once for his European tour. He spent July and August, 1896, in the study of some fifteen zoos in England, Holland, Belgium, France and Germany, returning with a rich hoard of information and at a travel-cost to the Society of but \$410.07.

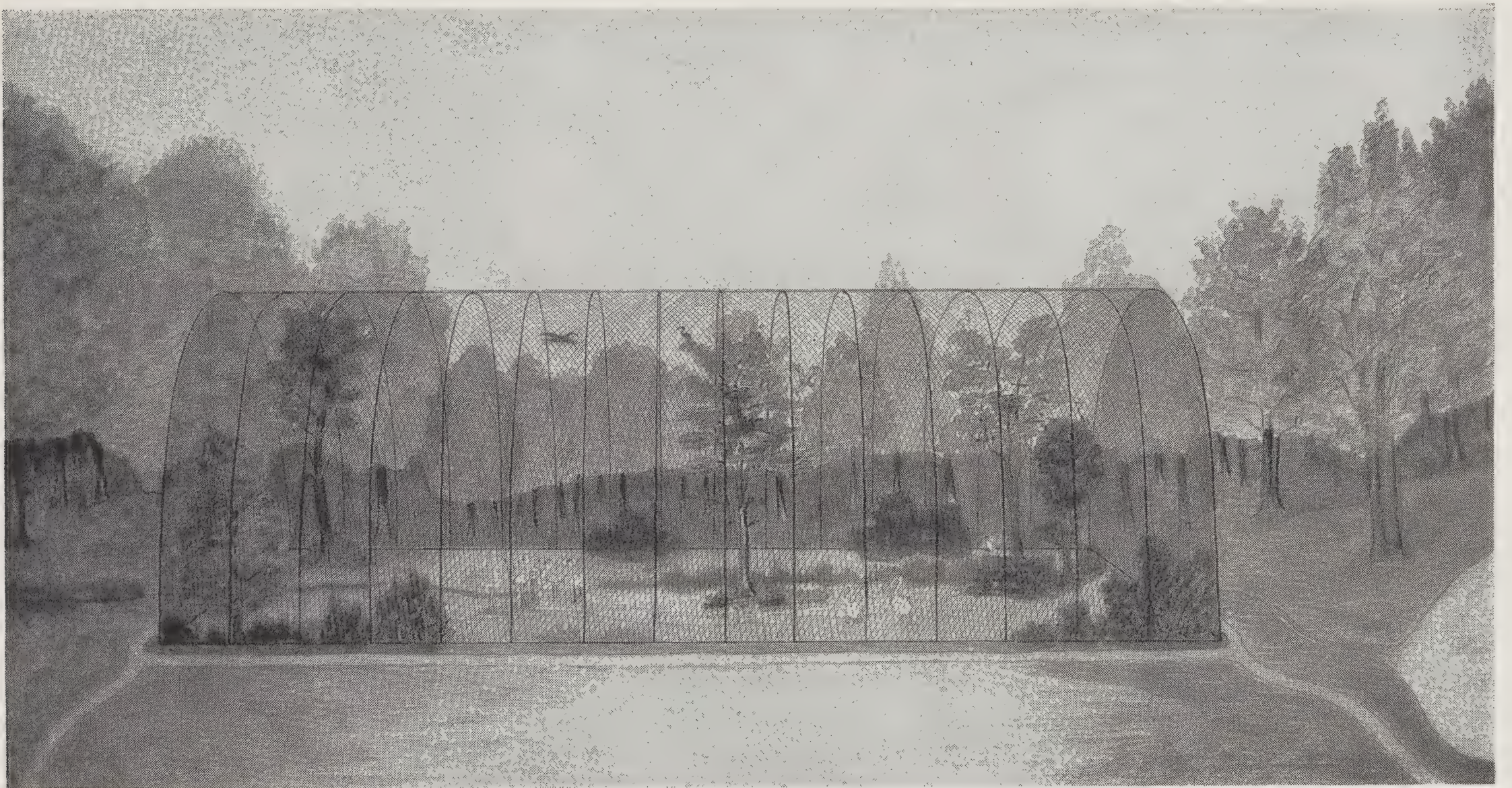
Choice of the location in South Bronx Park has never been seriously regretted, although in the early years it probably seemed a remote spot — as it has perhaps seemed to some of the Society's friends during recent tire and gasoline rationing. The land has always justified all the earliest hopes for it — with its broad sweeps of

grazing areas, outcroppings of rock, its varieties of water and, as time has gone by, its development of unusually fine forest tracts. It is highly doubtful whether any situation of similar acreage anywhere in this region could have been found so suitable for the display of such a range of animal life.

One of the most important points — perhaps the *very* most important — which Dr. Hornaday



**WILLIAM TEMPLE
HORNADAY**
Director, 1896-1926



In an old portfolio of drawings and rough sketches, made while the Zoological Park was still in the planning stage, we found this watercolor by Director Hornaday, visualizing the great Flying Cage in the Zoo.

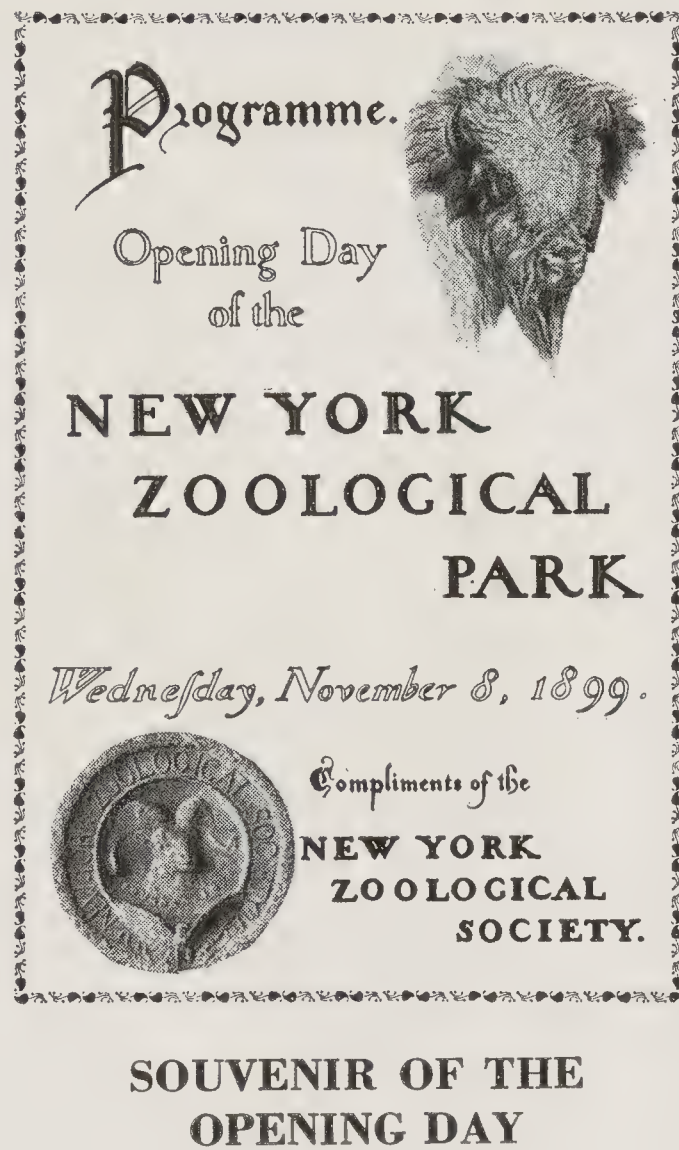
brought back from his European tour was the need for scope in a zoological park — room to turn around; space in which to show animals naturally. In the "Preliminary Plan for the Prosecution of the work of the Zoological Society" submitted to the Executive Committee on November 26, 1895, the following passage occurs:

"The largest area of any Garden now in operation abroad is about sixty-three acres, a limit imposed by necessity, not by choice. . . . It is therefore evident that with the large tract of land at our disposal it is possible for the New York Zoological Society to depart from the . . . restrictions of these older Zoological Gardens, and attempt to embody in our exhibit a new principle. . . . This new principle, or central idea of our exhibition, will be to place both native and foreign animals of the tropical, temperate and colder

regions as far as possible in the natural surroundings."

These words, now fifty years old, appear over the signatures of the first president of the Society, Andrew H. Green, and those early and great friends of the organization, Henry Fairfield Osborn and C. Grant LaFarge.

In the next twenty-five years they and their like did build the greatest zoological park in the western world on the principles enunciated in this report of 1895. Today, in 1946, on the same site and acting on the same principles, the Society has the opportunity, the pleasure and likewise the responsibility of carrying the Park to new and even greater heights of beauty and community value. In many important ways the days of the Society's greatest local and national worth lie almost entirely in the future.



The Life of the Waters

By CHRISTOPHER W. COATES

IT IS RECORDED that the Founding Fathers of the Zoological Society were not enthusiastic about accepting responsibility for the management of the municipal Aquarium when that dark and dingy—but popular—institution was offered to them in 1902.

Not because they shirked the work of management or lacked a vision of the possibilities. Their concern, it seemed, was whether they would have a free hand to do what was needed to give New York City a real Aquarium. The fish exhibit they were asked to take over had been founded in 1896 by the Department of Parks and was

housed in the ancient fort-cum-amusement hall-cum-immigration station in Battery Park. The lighting was almost non-existent; the fish swam in near-Stygian darkness and visitors groped through halls equally black — and besides had to contend with foul air, for the ventilating system consisted of an open window here and there (on mild days). Altogether it was not an appetizing project to men whose hearts and energies were devoted to building a bright and shining new Zoological Park at the other end of the city.

But their doubts were resolved when it ap-

peared that the City government was willing for the Zoological Society virtually to write its own ticket about management. Contracts were signed and the formal transfer was made by Commissioner of Parks Willcox.

"There are educational advantages," he said, "which can only be secured and maintained by a fixed policy and scientific management. The splendid work already done by the Zoological Society is an earnest of what it can and will do with the facilities afforded here."

And so, late in the afternoon of the last day of October, 1902, the Aquarium in Battery Park became linked with the Zoological Park through the medium of the Society. It was the second day of creation in the history of the Society; the world of the waters was now joined with the life of the land and the air and the Society had two bases on which to erect its twin structures of exhibition and education.

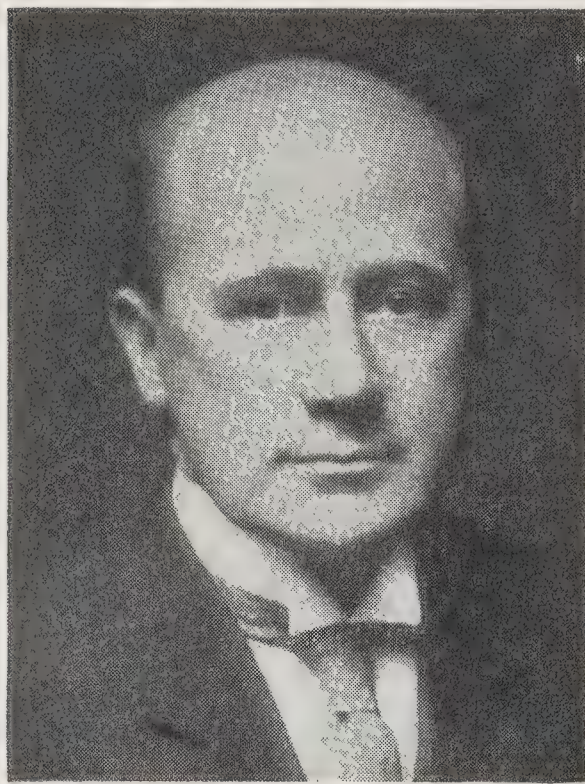
Looking backward, the Zoological Society can

only congratulate itself on the acquisition of the Aquarium — many as have been the headaches in its management over the years, for while the

Society's administrative relations with the municipality were always satisfactorily in accordance with the original agreement, there was one ultimate problem that could never be solved: *no* Society, *no* agreement, could ever make an Aquarium "work" properly in a building that was designed as a fort. What was basically needed was a new Aquarium for New York City and many have been the assertions of the Society's officials over the years to that effect.

Only now, as will be pointed out elsewhere, is the problem on the way to solution; the old Aquarium

in Battery Park is no more, since the fall of 1941, and its staff has been kept together at the Zoological Park to manage the small, experimental, "interim" exhibit of tropical fishes and to plan a great new Aquarium truly worthy of the city and of the Society.



**CHARLES HASKINS
TOWNSEND**
Director, 1902-1937



Grim and fortress-like, betraying its origin, the New York Aquarium is pictured here as it was in 1906, four years after the Zoological Society took over its operation. Subsequently it was remodelled somewhat.

But to get back to the old institution — young then — that the Zoological Society acquired in 1902. It was, as I have said, always a popular place of call for New Yorkers and perhaps particularly for out-of-towners. Even in 1902 the attendance averaged 5,000 persons a day (without ventilation!) and 1,500,000 to 2,000,000 a year. That popularity it retained, and increased, under Zoological Society management and when its doors closed on September 20, 1941, for the last time, it had registered 84,336,316 visitors through those massive fortress portals since the Society took over — an average of 2,162,469 a year.

It is a curious thing, in a way, that while the general public thinks of the old Aquarium purely as a place of entertainment and of education (for many of the exhibits, such as the model fish hatchery, the electric eel exhibits, and so on were well designed to make facts sink into the mind), we of the staff remember best the tremendous volume

of research that was done within its walls or under its sponsorship, and the many practical problems the Aquarium helped to solve. Research, of

course, was one of the prime aims of the Zoological Society and while exhibition of the beauties and monsters of the deep, the common and the uncommon of the water world, had always to be kept in the forefront of our thoughts, the chance to be of wider usefulness through research was always being sought.

Even in its infancy, the Aquarium was recognized as being the largest in the world (for under the Society's management the tank space was increased enormously and in 1927 a third story was added), and under the guidance of its first director, the late Dr.

Charles Haskins Townsend, it quickly became the center from which other Aquariums drew knowledge, strength and nourishment.

Nourishment I mean literally, for uncounted thousands of fish bred here or acquired from collectors by the New York Aquarium were regu-



**THE AQUARIUM
IN ITS HEYDAY
AT THE BATTERY**

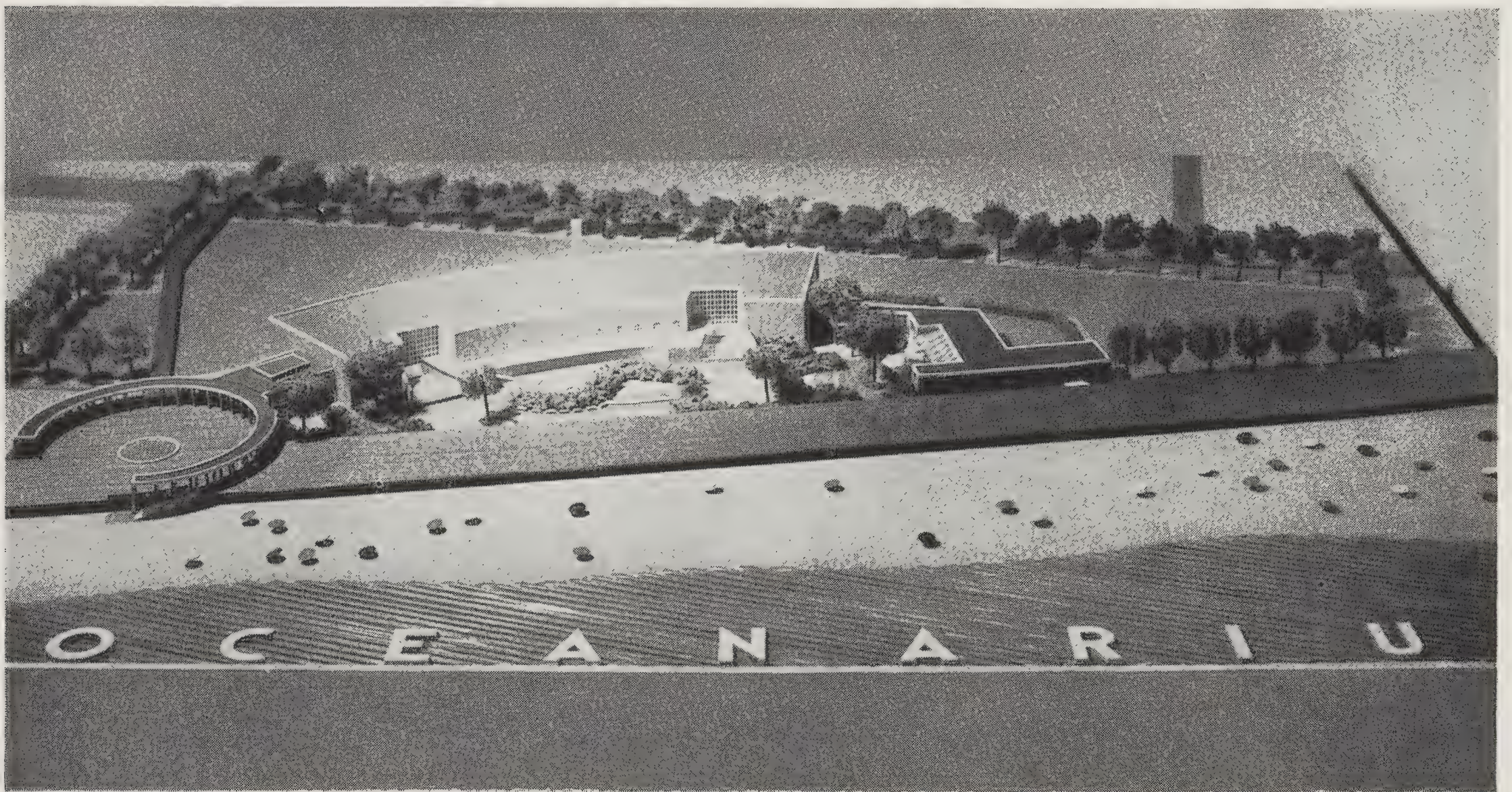


In 1905 the Aquarium often sent "expeditions" from the Battery to the Zoological Park to restock the lakes or seine specimens for the tanks downtown. It took about a full day to make the leisurely round trip.

larly shipped to or exchanged with other Aquariums in the United States and abroad.

As early as 1904 Prof. I. Itani, the Fishery Commissioner of Japan, came to the New York Aquarium to study fish culture in the newly established hatchery. It was only a small hatchery, in truth, but it was efficiently run and for years some 2,000,000 young fishes each year were

reared. Lighting schemes, label methods, filters, pumps — most of the schemes being thought of today for installation in the new Aquarium have been the subject of experiment in the old Aquarium and the good and the bad features of each have been ticketed. In a way, the old Aquarium was a gigantic experimental laboratory for the Aquarium of the future. We could not always



And this—a far cry from the old “roundhouse” at the Battery!—is the architect’s conception of the great new Aquarium that is planned for New York City. Present thinking calls for its construction on the oceanside at Coney Island, and it embodies new techniques for presenting the varied life of the waters.

liberated in the waters of New York State as a contribution to the restocking of streams.

In 1905 the fame of the Aquarium had spread so far that representatives of the governments of New Zealand and Brazil, and of the City of San Francisco, came to “see how it was done.”

It is the proud boast of the New York Aquarium that since 1905 not a single Aquarium has been built in any city in the world without definite, specific contributions from the practical knowledge of our staff.

Methods of feeding, of collecting, of breeding and rearing fishes, still in use today, were worked out in the old fort in Battery Park. There are few exhibition devices that were not tried out there — behind-the-scenes devices for the most part, it is true, for the better maintenance of the collections, but vitally important to every Aqua-

determine how to create some dramatic new exhibit because of the spatial limitations, but we surely know what to avoid, what not to do!

“In earnest,” as the Commissioner of Parks said in 1902, of what the Zoological Society could and would do with the facilities then being added to it, it is noteworthy that during the first year of its management, the Society encouraged research by the staff into the control of infected oysters and clams for human consumption; the Aquarium provided room, specimens and maintenance skills to the investigators in the city’s Department of Health. In the next year the Aquarium was working with the public authorities on mosquito control, and preparing public exhibits showing what to do and what not to do. In 1907 a makeshift laboratory was jammed under the roof of the old building to enable the Aquarium staff to

work on pollution of the harbor — a study that bore important fruits, as will be seen if one compares the harbor waters of today with the waters of nearly forty years ago.

There would not be space in the whole of this issue of the Zoological Society's magazine to list all the health and research problems in which the New York Aquarium has engaged since 1902. They are continuing problems, many of them, lasting over long years. A quick solution is good,

but there are no quick solutions to many problems. The Aquarium has had the patience and the perseverance to stick with them. It looks forward, in the Aquarium that will some day be built in New York City, to more problems, more chances for expounding the wonders of the water world, a flourishing of the dreams we have for making the life of the waters as exciting, thrilling, significant to the general public as it is to us of the staff.

Roads to Research

By LEONARD J. GOSS

“HORSE DOCTOR” AND “DOC” were terms used by lay people in referring to Veterinarians in 1901 when the Society formed its first medical department. The department consisted of the eminent medical pathologist, Dr. Harlow Brooks, and Dr. Frank H. Miller, New York's No. 1 Veterinarian at that time. Those of us who were fortunate enough to have known Dr. Miller would never have thought of calling him anything but “Doctor,” for he was the epitome of professionalism. Dr. Miller made daily calls to the Park from his 54th Street office via surface car and then by horse and carriage through the country surrounding Bronx Park. Dr. Brooks performed the laboratory work of the department in a room under the eaves of the Service Building behind the Reptile House. In the same building were offices for the forester, civil engineer, photographer and label writer and store-rooms for publications. One can well imagine that only the smaller specimens dying in the collection arrived at the second floor dissecting room!

The foresight and thoroughness of the Society's founders is reflected in the early establishment of the medical department. It is remarkable that in laying out the Park consideration was

given to all the future requirements of this “new-born child” to assure its development into a strong, healthy adult; we may learn from the ANNUAL REPORT of 1900 that the founders were concerned not only with the illnesses this new child might develop but also with science and research for science's sake. They put it in writing that the scientific duties of the next year included recording the lives of animals in captivity and their treatment in disease, and that the results would be published. They reported the use of general anesthetics in Alligators, Crocodiles, Wolves, Bears, Antelopes and Monkeys. Interestingly, the financial section of the Report shows the following:

Medical attendance in 1900:

For animals	\$ 56.50
For employees	147.50

In 1901, these expenditures are listed:

Medical attendance:

For animals	675.00
For employees	194.00

The substantially greater expenditure for the health of the animals reflects in part the growing size of the collection, but principally the emphasis being placed on the new medical department. Apparatus and equipment for it were lent by the



In 1902 the first laboratory of the Zoological Park was connected with the office of the Veterinarian, and it occupied these cluttered quarters under the eaves in the old Service Building behind the Reptile House. Only the smaller specimens found their way up the narrow stairs to the tiny dissecting room!

Carnegie Laboratory and were adequate if not elaborate. So important did the medical and research work loom that in 1902 Dr. W. Reid Blair was appointed Medical Assistant, and in 1903 he became full-time Veterinarian succeeding Dr. Miller.

The first animal operation in the Park was the lancing of two abscesses on an Alligator. Our illustrations give an idea of the *modus operandi* and equipment in those days as compared with the surgery and operating facilities in the present Animal Hospital.

As early as 1903 the Medical Department had gone far beyond purely clinical work. It had taken upon itself inspection of food supplies, supervision of nutrition, improvement of drainage in corrals, control of algae in pools, disinfection and control of odors and keeping of permanent case records. In the same year recommendations were made that subscriptions be taken to medical journals and that we establish a museum and a library. Looking ahead, the department was already thinking of interesting outside scien-

tists who could carry on research in the Park and of the erection of a permanent Hospital and Biological Laboratory for the study of animal diseases and behavior.

Through the combined efforts of Dr. Brooks and Dr. Blair, the Society embarked on a well-founded program of scientific endeavor. Not only were sick and injured animals to be treated but the pathologist was to perform autopsies and record the disease conditions encountered regardless of their relationship to the death of the animals. It was realized it would be impossible and impractical for two men to attempt to do all the clinical work and cover all the fields of medicine in the laboratory — hence the proposal to interest workers in other institutions to come to the Park for their studies. This proved to be an easy assignment. In 1905, Professor William Gies volunteered his services and those of the Department of Physiological Chemistry of Columbia University. It was the first of the requests for collaboration between the Society and other scientific institutions that continue to this day. In



In 1904 an operation or the treatment of an ailing animal were not as simple as they are today, for the Veterinarian's instruments usually had to be transported to an improvised operating table in or near the animal's cage. Here Dr. W. Reid Blair (left) and Dr. Hornaday (right) are treating a monkey. But the Veterinarian's operating technique and insistence on sanitation were as rigorous then as they are now.



Today the Zoological Park's Veterinarian has greater conveniences at his command—a spotless Surgery in a corner of the Animal Hospital building, where the smaller animals can be brought for treatment. Within reach of the operating table are cabinets of sterilized instruments, and a fully equipped laboratory and X-ray room enable the Veterinarian to make a quick check of his findings in any particular case.

1912 Dr. G. A. MacCallum began making autopsies on fish and later (1915) he was appointed pathologist for the Aquarium.

Dr. G. S. Huntington was appointed Prosector of the Society for the College of Physicians and Surgeons in 1913. The cadavers taken by the prosector were used for "general morphologic investigation of the individual forms, and in furtherance of the special lines of research now under way in the laboratory." These studies included work on every system of the body, digestive, circulatory, skeletal, nervous, etc. By 1932, the list of scientific collaborators had grown tremendously and included such men as Henry Fairfield Osborn, Hans Zinsser, George Crile, Karl Landsteiner and Arthur Coca.

The Society's ANNUAL REPORT for 1915 carries a picture of a Giant Tortoise being lowered into a metabolism chamber under the supervision of Dr. Francis G. Benedict. When, today, members of our staff are subjected to a dull two hours' recital of a hypochondriac's experiences with a bas-

al metabolism test prescribed by his physician, they can generally halt it with a calm statement, "Shucks, we did that to our turtles in 1915!"

Today the Society maintains a well-equipped Animal Hospital and laboratories in the Aquarium and the Department of Tropical Research. Facilities for disease diagnosis and treatment include X-ray, surgery and diagnostic laboratories. Considering the size of the staffs and their routine duties, we carry on a remarkable amount of research, which is greatly enhanced by our policy of cooperation and collaboration with other scientific institutions.

Our brightest dream will be fulfilled when the Society can boast of a Biological Research Laboratory with a staff of scientists in such fields as anatomy, pathology, biochemistry, parasitology and psychology. Then, indeed, the potentialities of our Society would be realized as we pushed ahead, full time, in research in the fields of medicine and the underlying sciences in the war against animal diseases and human suffering.



**DR. HORNADAY'S
ORIGINAL SKETCH,
MONKEY HOUSE**

With a Roving Commission

By **WILLIAM BEEBE**

A GREAT stretch of tangled undergrowth and sweetbrier, of dense, untrimmed woods, of worried mink, tramps and musk rats, with here and there a few paths, fences and disheveled foundations of buildings: Such was the setting on October fourth, 1899, when I first visited the Bronx Zoo, and in conference with Professor Henry Fairfield Osborn and Dr. Hornaday became Assistant Curator of Birds. My duties began on the sixteenth of the same month with a collection of sixteen ducks and herons.

One year later, in August, 1900, a brief vacation expedition to Nova Scotia resulted in living specimens brought back to the Zoo and many notes and photographs of wild creatures. This was the prelude to all coming expeditions which were to eventuate in the 45th in the year 1945.

In 1906 Professor Osborn suggested the use of the title Tropical Research for our extra-Zoo scientific activities, but not until 1916 was the title formally adopted and the department installed as a concrete entity of the Zoological

Society. Mr. Fairfield Osborn has presented an adequate resume of its activities in "Scientific Odyssey" in *ANIMAL KINGDOM* for January-February, 1941.

The dominant objects of the department have always been two in number: First, the prosecution of pure science, the endeavor to learn as much as possible about the past evolution and the present life histories of the earth's wild creatures, always checking and consolidating this knowledge with accurate identification, dissection and correlated laboratory studies. The completion of this first object is attained with the publication of the facts, satisfactorily illustrated, in the Society's *ZOOLOGICA*.

The second object is Education in its widest application, the translation of the technical scientific results into language of equal accuracy, but adapted to the understanding, appreciation and enjoyment of the intelligent layman. This

phase of the expression of our work, stemming directly from our expeditions and laboratory researches, takes the form of paintings, photographs, color motion pictures, lectures, exhibitions, books and articles, with a major accent on contributions to our own *ANIMAL KINGDOM*. It is the lawful pride of the director and his staff that a not unsatisfactory balance of the two main objects has been sustained throughout the four and a half decades of our activity.

Best of all, results do not cease with our direct efforts, as in the case of departmental volumes which have now been translated into fourteen foreign languages, as well as Braille for the blind, Armed Service Editions for soldiers and sailors in distant lands, and still other books microfilmed for projection on the ceilings of service hospitals, so that sorely wounded men, helpless on their backs, may read as they lie on their beds.



In 1925 the Department of Tropical Research sailed on one of its most elaborately equipped expeditions, aboard the "Arcturus," to the Sargasso Sea and the Galapagos Islands. This is the shipboard laboratory.

The exigencies of space in ANIMAL KINGDOM limit this present essay to about one thousand words, so only a merest cobweb skeleton can be presented, fortunately for our readers statisticless and brief. Popular observations and records of the lives, the successes and tragedies of wild creatures of sea and jungle should be presented with the quiet deliberateness and charm of diction of the early writers of the century, rather than in the current neological frenzy, the Flash! Flash! of radio commentators.

Here are a few sentences sailing a medium course, a baker's dozen "Believe-it-or-nots," or "I - didn't - know - thats" which come to mind through nearly a half century of exploration, from all quarters of our round earth, and from among many thousands of other occurrences. The impact on our minds was that of miracles, though many of the happenings were not new discoveries.



I—*Unbelievable Parenthood*: A starfish and a sea urchin, through the accident of being crushed together in a pail, became, in an early field laboratory of ours, the parents of a host of strange, graceful, free-swimming larvae, as unlike their parents as hummingbird and armadillo. (Expedition No. 1. Nova Scotia, August 23, 1900.)



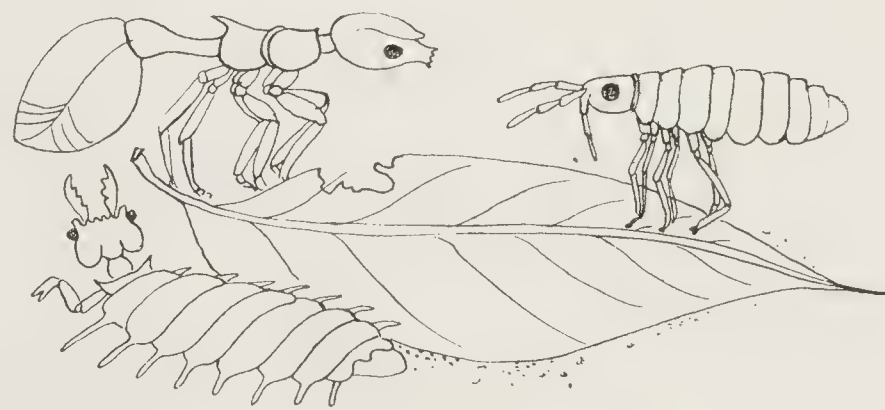
II—*Reincarnation of Genesis, Chapter I, Verse 2*: A first view of an active volcano, of molten, boiling, flowing rock, of Mother Earth "without form, and void," (like the first glimpse of Saturn's rings) should do things to your deepest emotions. It does! (Expedition No. 4. Colima Volcano, Mexico, January 24, 1904.)



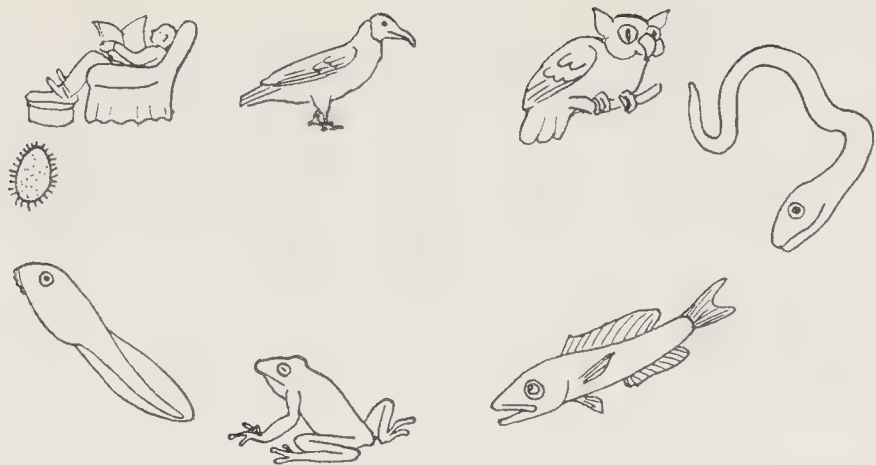
III—*Fossils in the Making*: To see a dead ocelot, a squirrel being slowly sucked down and embalmed in a lake of soft pitch is to learn at first hand how the bones of some ancient creatures have been preserved through past ages. (Expedition No. 5. La Brea, Trinidad, April 10, 1908.)



IV—*Incredible Intricacy of Courtship*: A thousand-eyed Argus Pheasant screaming his summons to a mate in the heart of the jungle, and then performing his elaborate dance for her in the center of his cleared arena is a precious memory. His theatrical stage took him weeks of strenuous effort to prepare, but the exquisitely complex decorations on the tapestry fan of his spread wings have required millions of years for their gradual development. (Expedition No. 7. Rejang River, Borneo, July 17, 1910.)



V—*Ant's-Eye View of the Jungle*: A war-bag full of hastily scooped up leaves and moss from four square feet of jungle floor was found to shelter more than one thousand living beings visible to the eye. So little known is this World of Small that there were several genera of diminutive ants quite new to science. (Expedition No. 9. Pará, Brazil, May 9, 1915.)

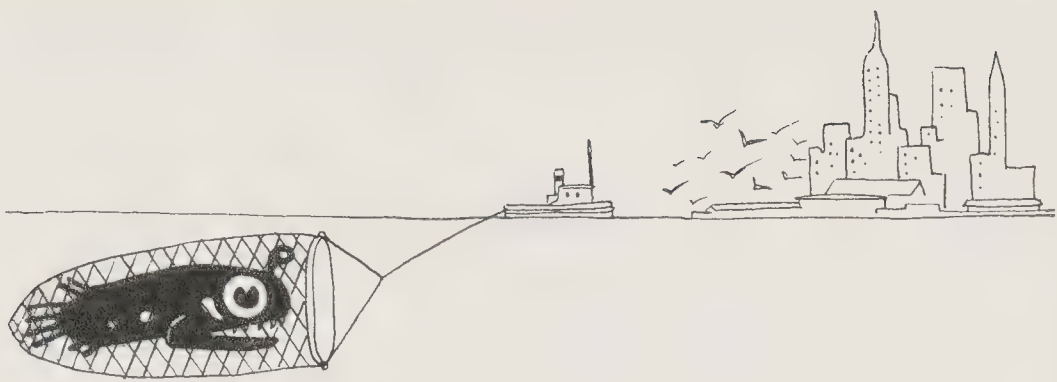


VI—*A Chain of Jungle Life*: The dependence of every form of life on other forms was never more vivid than when once in South America we found an unbroken chain of ten living links, beginning with microscopic parasites living in the intestine of a tadpole, and ending with you, as Reader of this. We even made a 14-line doggerel of it which went as follows: This is the Story of Opalina, Who lived in the Tad, Who became the Frog, Who was eaten by Fish, Who nourished the Snake, Who was caught by the Owl, But fed the Vulture, Who was shot by Me, Who wrote this Tale, Which the Editor took, and published it Here, To be read by You, the last in the Chain of the tropical jungle.

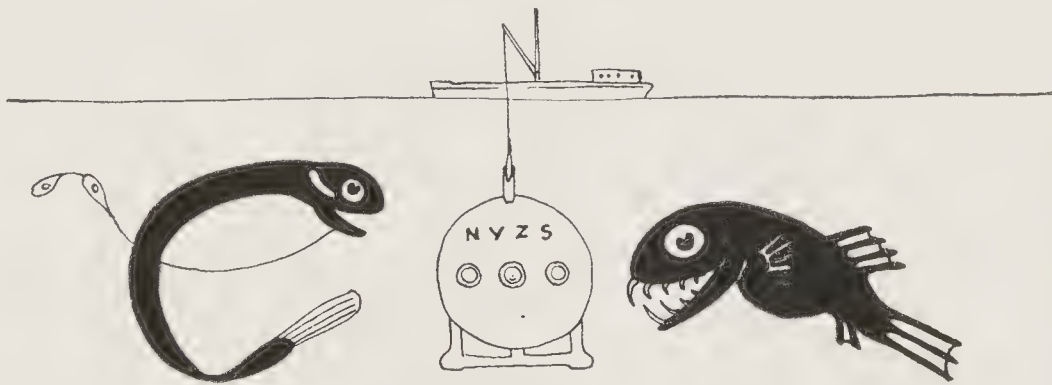
Several years after first publication an eleventh link in the chain was unexpectedly forged, for the Yale Glee Club set it to music and sang it for several seasons! (Expedition No. 14. Kartabo, British Guiana, July 29, 1922.)



VII—*The Land Without Fear*. When we explored the Galápagos Islands, far at sea off Ecuador, fear had not preceded us. It was an archipelago of animals, most strange and most tame. Great lizards came close to our tents, mockingbirds and huge-billed finches perched on our hands, hawks rested fearlessly on our gun barrels, we lifted great frigatebirds from their eggs and replaced them, baby sea-lions allowed us to stroke them. No wonder that Charles Darwin, the most gentle of all naturalists, found inspiration in the animal life of these islands. (Expeditions Nos. 15 and 17. Galápagos, 1923 and 1925.)



VIII—*An Unexplored Cosmos Near New York City*: Three net hauls made from a tug, one hundred miles off shore, and a mile down in the sunken Hudson Gorge, brought up fifty-five species of deep-sea fish and squids. There were long-fanged dragons trolling luminous baits, transparent abyssal ghosts, others blazing with hundreds of their own lights. Many of the fish were of species never before seen by man or known only from great depths off Japan. One hundred miles southwest of our city brings us to Philadelphia; the same distance to the southeast of New York City lies directly above the least known area left in the world. (Expedition No. 21. Hudson Gorge, off New York, July 8, 1928.)

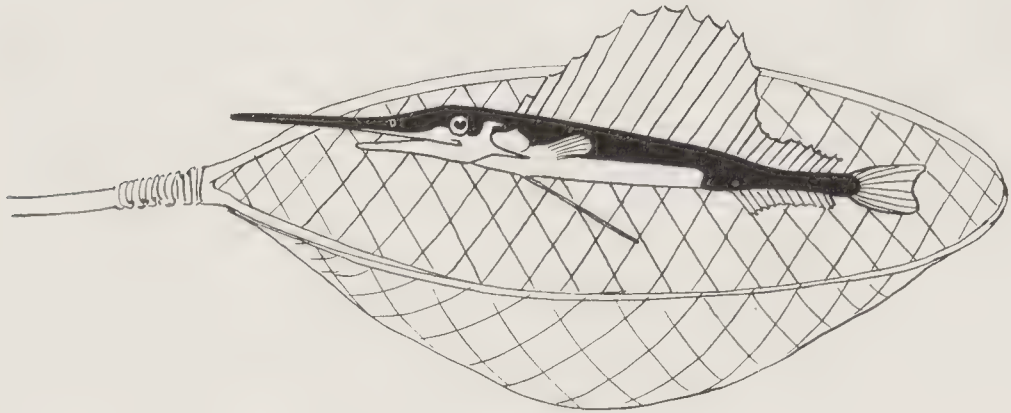


IX—*A New World Visited*: At nineteen minutes past eleven o'clock in the morning of an August fifteenth, I looked out into icy water of utter blackness a full half mile down below the surface of the sea. Through the quartz windows of the bathysphere, each holding back twenty tons of watery pressure, I saw a school of weird, unnamed creatures swimming slowly along, looking like animate strands of luminous lace drifting in a vacuum of jet. (Expedition No. 30. Off Bermuda, August 15, 1934.)

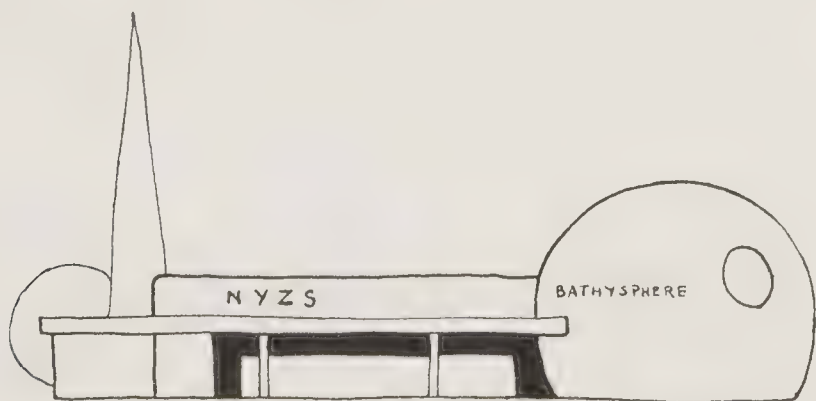


X—*Conservation of Birds of Paradise*: After an hour's pull and a perilous landing between reefs,

we once landed on a tiny island off Tobago and for the first time in our lives listened to the unforgettable *Wok! Wok!* of wild birds of paradise. Before we left we heard eight birds and saw six more flying against the azure sky, trailing their filmy lilac plumes. This is superb conservation, magnificent birds successfully transplanted from New Guinea, half way round the world to a West Indian island, where they are contentedly breeding. (Expedition No. 33. Little Tobago, February 11, 1936.)



XI—A *Baby Giant*: At midnight on a March first I was reading in my bunk on the *Zaca*, when a dripping hand net appeared down the companionway, and in it, lying on the meshes, was a sailfish exactly one and five-eighths inches long. It was as surprising as though an elephant two inches over all had walked in the cabin door. It was by far the smallest sailfish ever seen and it had come to the submerged light alongside, twenty-three miles off shore, in company with infant demoiselles, squirrelfish, jacks and butterflyfish. Small as it was, it showed few divergences from its parents who may well have been ten feet and two hundred pounds. It is the unexpected first view of an Alice-in-Wonderland vision such as this which makes the life of each of the department's staff one long expectancy and excited realization. (Expedition No. 38. On board *Zaca*, off Costa Rica, March 1, 1938.)



XII—From *Ocean Abyss* to *World's Fair*: The Zoological Society's exhibit of deep-sea fish and squid in a darkened environment, illumined with ultra-violet light, was the most successful artificial reproduction of an ultra-strange world ever

achieved by the Department of Tropical Research (World's Fair, Long Island, 1939 and 1940.)



XIII—A *Myth Proved True*: For years the tale has been told and thoroughly disbelieved that the six-inch Hercules beetles of Venezuela carry away, Sabine-fashion, the smaller females, transporting them in their huge, pincer-like horns. Day after day, believe it or not, these huge insects did this very thing before our eyes at our new Field Station. (Expedition No. 45. Rancho Grande, Venezuela, July 9, 1945.)

On October sixteenth, 1945, I walked along several of the old paths of the Zoo, passing the Flying Cage, the Sealion Pool, the buildings which had so faithfully served the public since they rose from their foundations six and forty years ago. I saw the realization of such new ideas as the African Plains and Children's Zoo, and finally went into the laboratory of my own Tropical Research Department. It was quietly humming with scientific work and plans for the coming Venezuelan Expedition. I felt what a grand thing it was, as an officer of the Zoological Society, to be able to look back to an inspired beginning, to survey the successful present, and to plan for an idealistic future.

BIBLIOGRAPHY OF DEPARTMENTAL HIGHLIGHTS

1. "Log of the Sun:" *Secrets of the Ocean*.
2. "Two Bird-Lovers in Mexico:" *Camping near the Twin Volcanos*.
3. "Our Search for a Wilderness:" Chapter II, *The Lake of Pitch*.
4. "Pheasants: Their Lives and Homes:" *Bornean Argus Pheasant. Zool. Soc. Bulletin*.
5. "Jungle Peace:" Chapter X. *Zoologica*: Vol. II, *Fauna of Four Square Feet of Jungle Débris*.
6. "Jungle Days:" Chapter I.
7. "Galapagos: World's End:" and "Arcturus Adventure."
8. *Animal Kingdom*, Vol. 32, *Fishing a Mile Down in Hudson Gorge. Zoologica*, Vol. XII, Nos. 1 and 2.
9. *Animal Kingdom*, Vol. 37 for 1934. "Half Mile Down."
10. *Animal Kingdom*, Vol. 39, *A West Indies Grand Tour*.
11. "Book of Bays:" *From Baby Sailfish to La Esperanza. Zoologica*, Vol. 26, *A Study of Young Sailfish*.
12. *Animal Kingdom*, Vol. 42, page 87.
13. Not yet published. *Animal Kingdom*, Vol. 48, pages 1 and 152.



BEFORE the American Bison Society was organized in the New York Zoological Park on December 8, 1905, there were only 969 Bison left in the United States and our finest and largest mammal seemed headed for certain extinction. The American Bison Society helped to save the species by establishing protected herds under government supervision.

In 1917 The Zoological Society commissioned Carl Rungius to paint "In the Days of the Bison Millions" for our Gallery of Wild Animal Paintings. The scene is laid in northwest Wyoming.



THE MALAY Bronze-tailed Peacock Pheasant lives in "a land of dreadful silences," where the sodden jungle swarms with leeches and it is torture to stand still long enough to watch the bird as it skulks through the underbrush, as Dr. William Beebe wrote in his "Monograph of the Pheasants." Late in the afternoon the pheasants fly to the top of some dead, isolated tree from which they watch the sun setting across the jungle wilderness.



MANY TROPICAL FISHES have the curious ability to change color instantly—and radically—in response to varying moods and excitements. For some years the late Dr. Charles H. Townsend of the Aquarium made a study of these color changes, and published a great series of them in color in the Society's technical journal, *Zoologica*. This plate shows five typical color changes in the Coney, *Bodianus fulvus*, as observed in the Aquarium.



ONE OF THE most brilliant illustrations in "A Monograph of the Pheasants," which the Zoological Society published in 1917-1922, was that of Temminck's Tragopan. "Its home is in the great heart of China, far from the beaten trails which all travellers follow, and among the oaks and rhododendrons of high altitudes," Dr. Beebe wrote. "This Tragopan spends much of its time among their gnarly branches, feeds on their buds and fashions its nest in the dense foliage. Few white men have seen it in the wild."

NINE HUNDRED FATHOMS down the deep sea fish (*Omosudis lowii*) drive through the black and icy waters in pursuit of luminescent scarlet squids. This is an illustration by Elsie Bostelmann of some of the strange creatures brought up from the depths of the Atlantic by the Bermuda Oceanographic Expeditions of the Department of Tropical Research.



FOR MANY YEARS a “star” attraction of the Reptile House was a Brazilian Horned Frog, *Ceratophrys dorsata*, represented here in a painting by Helen Tee-Van. Its home is in equatorial Brazil; it utters barks and “wailing” sounds when angered, and it is capable of giving a severe bite.





“THERE GOES a Vandyke!” Audubon used to exclaim when, a solitary wanderer in some gloomy swamp, he looked aloft to see the graceful swoop of an Ivory-billed Woodpecker. Now the bird is almost extinct. This lovely canvas in the Society’s Gallery was painted in 1936 by George M. Sutton.



MOST SPECTACULAR, perhaps, of all the displays of the Birds of Paradise is that of Prince Rudolph's Blue. For many years these courtship gyrations have been studied (and several of them described for the first time) by General Curator Lee S. Crandall. In 1920 he described the display of the Blue, and the Society engaged Herbert Kurth to make these color drawings.



In the days when game hogs roamed the land. "Two Hunters of Kansas City Who Believed in Killing All that the Law Allows" is the way Dr. Hornaday entitled this picture. It was reproduced—with great effect—in several Zoological Society publications while we were fighting to save wildfowl from extermination.

Conservation of Wildlife

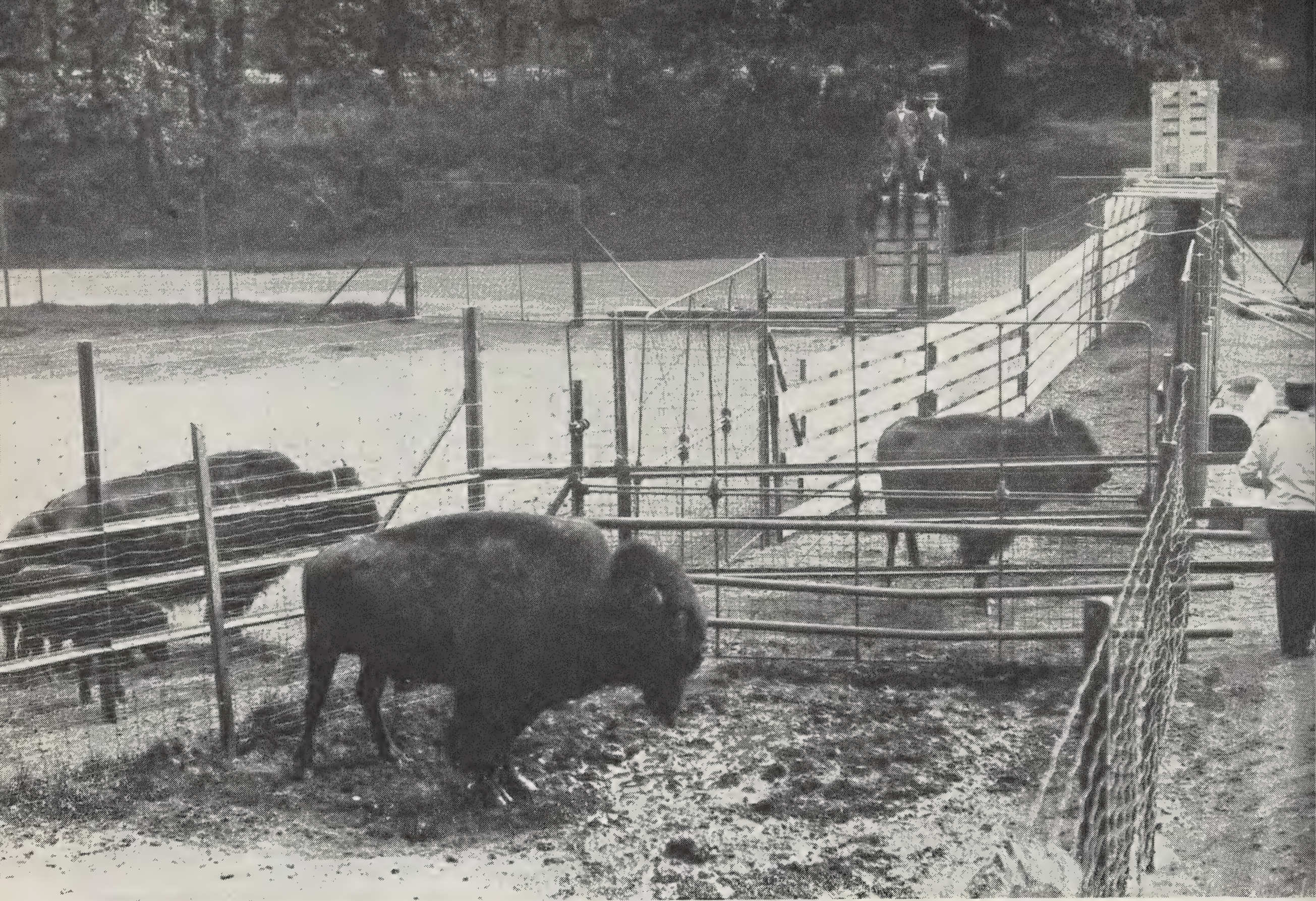
By FAIRFIELD OSBORN

IT IS NO EXAGGERATION to say that the Zoological Society contributed, to a very major degree, to the creation and founding of the Conservation movement in America.

Uncontrolled commercialism in furs and feathers, both here and in other countries, was reaching a climax of destructiveness, with results so dire that great families of animals had either been blotted out or were rapidly approaching the point of total extinction. The founders of the Zoological Society realized that drastic Con-

servation was imperative. They went into action on many fronts.

These activities were not conducted on an emotional basis but were prosecuted realistically only after careful studies of what was going on throughout the country. As early as 1898, in the second ANNUAL REPORT of the Society, there was published a long article by Dr. Hornaday on "The Destruction of Our Birds and Mammals," which contained a comprehensive survey of wildlife conditions at that time and included



Crating Bison on an historic occasion—preparing the shipment of fifteen head from the Zoological Park to the Wichita Game Preserve in October, 1907. The Zoological Society presented the animals—the finest in its herd—to the Government as a nucleus for the newly created preserve. Now the range has 700.

recommendations for specific measures calculated to save both wild birds and mammals.

Somewhat later the officers of the Society turned their attention to the serious situation of wildlife in Alaska and played a prominent part in gaining for that territory its first Game Act in the form of legislation providing for the protection of wildlife which was adopted in 1902, thus checking the indiscriminate slaughter of animals which had gone on up to that time.

These widespread efforts produced other specific results including the passage of the Bayne-Blauvelt Bill by the New York State Legislature, in 1911, to prohibit the sale of native wild game in New York State.

In 1913 legislation that for long had been actively urged by the Society, was enacted through the inclusion of a clause in the Tariff Act forbidding the importation of wild birds' plumage for millinery purposes.

All of these accomplishments were achieved only after long and bitter struggles against strong

opposition. The Society was also active in the promotion of the Weeks-McLean Bill which eventually developed into the international Migratory Bird Treaty between Great Britain and Canada and the United States, which was signed and ratified in 1916.

In 1913 the Zoological Society raised a fund of nearly \$11,000 for the publication and distribution, as a conservation and educational document, of "Our Vanishing Wild Life" written by Dr. Hornaday. More than 7,000 copies of the book were sent to all members of Congress, all members of state and territorial legislatures, all state and territorial governors, game commissions and state game wardens throughout the country, and to a great many public and private individuals and organizations interested in the protection of wildlife. This work was in effect the first thorough and systematic treatment of the subject of wildlife protection.

There were anxious times in connection with the saving of the bison in view of the fact that

the number of remaining animals was so limited. Great care was taken of those that had survived. They were divided into herds located at different points of the country, including a herd which was established at the Zoological Park. One of the dramatic events was the presentation to the United States Government by the Society in October, 1907, of fifteen animals from the herd in the Park for the purpose of forming a nucleus herd for the stocking of the newly created Bison Range in the Wichita Forest and Game Reserve near Cache, Oklahoma. In 1940 the total number of bison in the Wichita Bison Range exceeded 700 animals.

Years later the Society became interested in the preservation of the European bison, a majestic animal, threatened with total disappearance. In 1931 a survey was made of the small collections of the pure-blooded animals still to be found with a view to bringing about their rehabilitation through carefully considered methods

of breeding and maintenance. No report can as yet be made as to whether any of these animals have survived the last war.

The scope of our work is constantly enlarging and the year 1946 promises to be especially fruitful in that two new projects of unusual character and major importance are in the making.

The first of these involves the use of 12 acres of land in the northeast corner of the Zoological Park as a Conservation Exhibit to present the principles of wildlife management, reforestation, soil reclamation and stream control. There will be a demonstration building for the graphic presentation of Conservation problems and methods, and within the area there will be shown representative groups of the mammals of New York State such as white-tail deer, black bear, otter, beaver, raccoon and many of the smaller mammals; then, exhibits of the bird life of the State with representative species of wild fowl, hawks, owls and song birds, the latter in a large



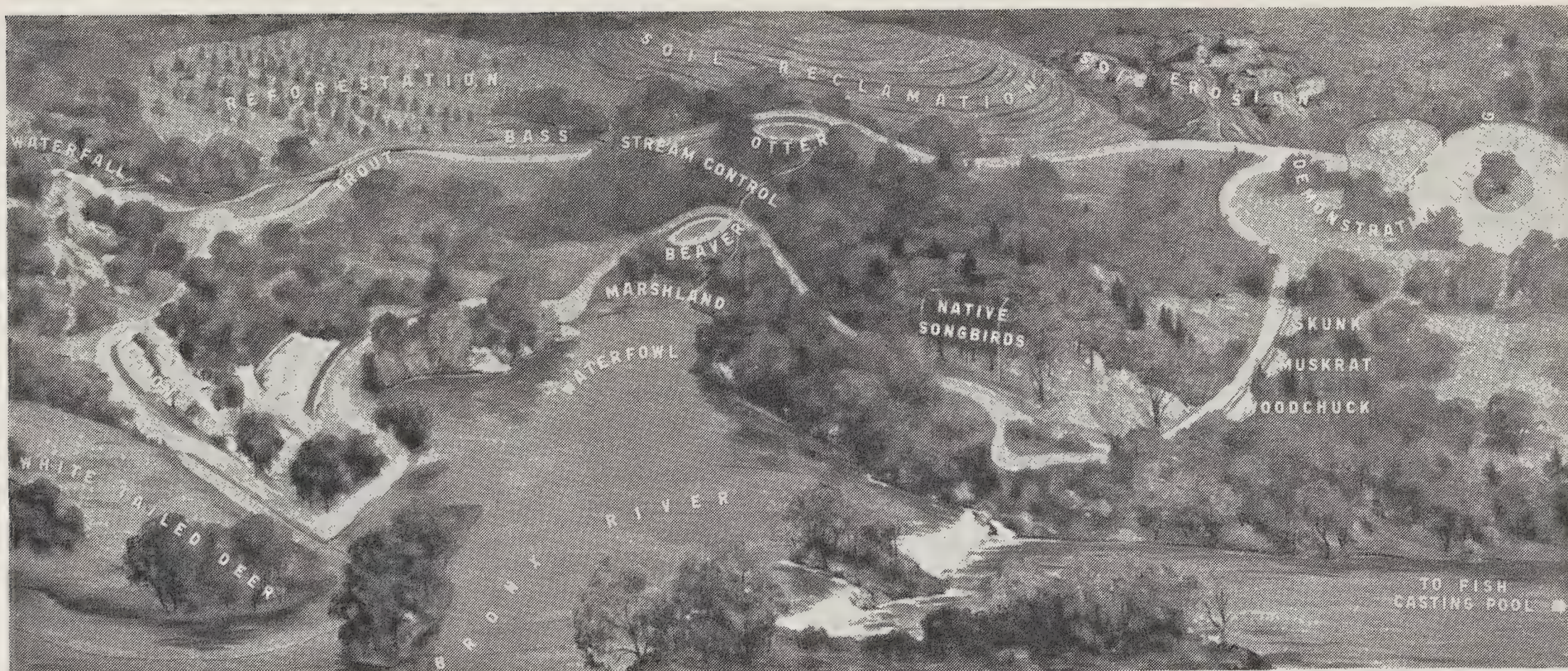
Crandall Photo

On these flats, with the majestic Grand Teton Range rising mistily in the distance, Elk and Moose will eventually roam at what seems to be complete liberty in the great Jackson Hole Game Park in Wyoming.

Another section of the Jackson Hole Game Park where Bison will be seen by visitors as they pass along the road in the foreground. The herd will be small, but visitors may see them plainly in the distance.

Crandall Photo





Because it believes that "Conservation" is likely to be merely an abstract term to many persons, the Zoological Society, in cooperation with the State Department of Conservation, is planning this practical demonstration of conservation methods on a 12-acre tract of wild land in the northeast corner of the Zoo.

flight aviary in a forest setting; and lastly, exhibits of native fishes, including, by means of a unique design, an under-water view of a trout stream! All exhibits of mammals, birds and fishes, together with special exhibits of reptiles and insects in the demonstration building, will be accompanied by explanatory material regarding the place and function of each kind of animal in the natural scheme of things. This explanatory material is indeed an essential part of the entire plan. This significant and novel project is being worked out in collaboration with the Conservation Department of New York State. It is hoped that legislation providing for the capital funds needed for construction will be voted during the present session of the State Legislature.

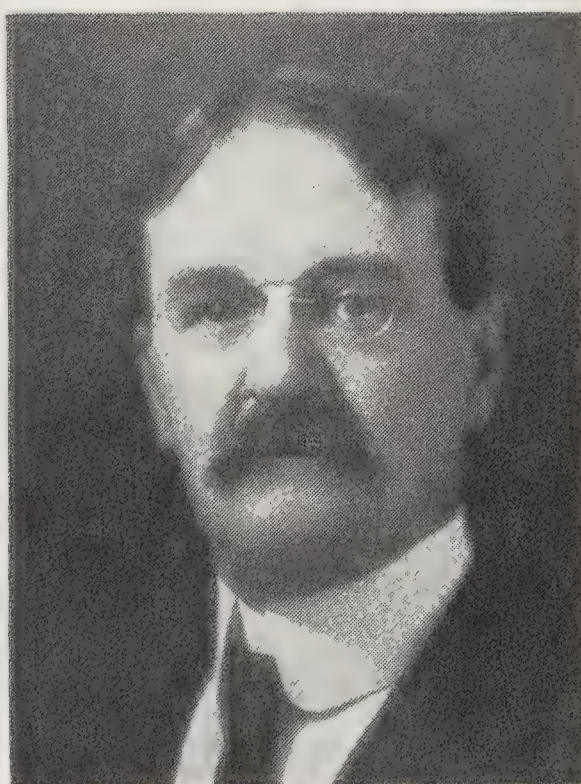
Work will be started during 1946 on the wild-life and conservation exhibit to be established in Jackson Hole, Wyoming, in the creation of which the Society will take active leadership. An article describing this appeared in the last issue of ANIMAL KINGDOM.

Our Conservation work today expresses itself in a number of other ways but there is not space here to describe them. Nevertheless, mention must be made of the financial support given to

various conservation activities by the Permanent Wildlife Protection Fund, of which the Society is trustee.

There are two major threats to civilization today. The first is the misuse of atomic energy. Everybody knows about that danger now, so presumably something will be done to ward it off. But very, very few people, relatively speaking, know of the other equal danger, namely the insidious, steady destruction of the natural resources upon which our lives depend — forests, water sources and soils. It is a danger of the greatest magnitude, already seriously affecting man, as well as wildlife, in many parts of the world. We have come to believe that it is our job to contribute everything within our power to bringing about public recognition of what is happening to these living resources. The problem is larger, more complex by far, than it was in the early days of the Society. It can only be solved through education—in the schools, in the colleges and universities and through widespread public information.

The barest start towards this end is in process now in this country and we are doing everything we can to stimulate this movement. The need for it cannot be too greatly emphasized.



**WILLIAM WHITE
NILES**

Treasurer, 1925-1935

Into Some Queer Corners

By WILLIAM BRIDGES

TO A LAYMAN, the source of a zoological park's animals is either puzzling or quite simple. The visitor sees a collection of strange animals from strange places and it is natural to wonder how they were gathered and transported. By taking thought, he comes up with an answer: "The Zoo sent out an expedition!"

There is magic, big magic, in that word "expedition." Every member of our staff who has done field work can tell amusing stories of appeals to join "your next romantic expedition." Bating the romance, the expedition is one of the useful means by which animals are acquired and since

the very beginning it has been the policy of the Zoological Society to send its men on collecting trips when circumstances made it likely they could do a better job than professional collectors and animal dealers. But far more importantly it has been the established principle of the Society that science, as well as its collections, would benefit by dispatching its men to study living things in the field.

As a result, our men have turned up in some very queer corners, indeed — stalking Blood Pheasants among the Himalayas, seining Paradox Frogs out of a pond in Trinidad, trapping Birds



On a mountain trail in New Guinea, native "boys" stop to rest while bringing out a great collection of Birds of Paradise. General Curator Crandall made this trip in 1928-1929.



This palm-lined pond in Trinidad was a favorite collecting spot for the late Dr. Ditmars and he visited it on all his trips to the island—for this is the home of the curious “Paradox Frog,” *Pseudis paradoxis*, which is ten to fourteen inches long in its tadpole stage, and only a fifth that long when metamorphosis is complete and it becomes an adult frog. On the collecting trip during which this photograph was made, Dr. Ditmars seined up twelve *Pseudis* tadpoles but only one survived a rough trip from the pond to Port-of-Spain. The survivor reached New York—the first Paradox Frog tadpole to be exhibited in any Zoo.



From 1919 to 1924 the Zoological Society's Department of Tropical Research maintained this field station at Kartabo, British Guiana, for an intensive study of the magnificent jungle and its wild life. From this laboratory came extensive collections and a long series of technical papers by the Society's staff.

of Paradise among their dancing trees in New Guinea, netting Vampire Bats in Panamanian caves, and, grotesquely caparisoned with telephonic headsets, listening to the crackling discharge of Electric Eels in a Brazilian creek.

By a rough count that excludes the almost annual field trips of the Department of Tropical Research (discussed elsewhere), it appears that the Zoological Society has sent members of its staff out on approximately fifty study or collecting expeditions in its first half century. And to those trips we owe many of the living glories of the Zoological Park's and the Aquarium's collections, shelves of technical and popular publications, and substantial contributions to knowledge of life histories of animals, behavior, relationships and taxonomy.

The Zoological Park was still in process of creation when Dr. William T. Hornaday made the first collecting trip, in 1900. He toured the West and Northwest to locate big game animals for the Zoo-that-was-to-be. In the same year Dr. Raymond L. Ditmars hired a horse and a buckboard and drove through the South Carolina swamplands, picking up snakes as he went.

The early years of the Zoological Park were, naturally, the most active expedition years, for although the young Zoo was overwhelmed with animals on a few occasions while construction was still going on, buildings and corrals quickly arose to absorb the supply. Within two or three years there were empty compartments and Director Hornaday was clamoring for animals. J. Alden Loring was dispatched to Alaska for big mammals, William Beebe to Gardiner's Island to collect birds, to Cobb Island and to Mexico to study bird life in the wild (the Society's interest in research and field study began to bear fruit here), and then as the years rolled on the scientific expeditions became constant and more evenly spaced.

Charles Haskins Townsend undertook to study and to save the Giant Tortoise of the Galápagos and brought back colonies of the great chelonians for study in this country; William Beebe circumnavigated the globe in quest of field observations on the pheasant; Lee S. Crandall penetrated the interior of New Guinea and brought out the greatest collection of Birds of Paradise in any zoological garden; Raymond L. Ditmars went

back to the American tropics year after year and returned home with visitor-compelling oddities—Vampire bats, meat-eating bats, Bushmasters, Parasol Ants, bizarre frogs. In more recent years the Aquarium staff under Dr. Charles M. Breder, Jr., explored the warm-water caves of central Mexico and brought back data on the eyeless characin of La Cueva Chica that is helping to solve the riddle of blindness in cave-dwelling creatures. Pursuing its long-time interest in the Electric Eel, the Aquarium sent its men to Brazil to study the behavior of these living dynamos

under natural conditions in their native streams.

What the field work will be in the future, it is too early to say. Surely in the next few years the expanding Zoological Park and Aquarium will require a vast amount of restocking and our men may be off to distant parts again. When they return, they will bring more than a collection of animals; the important part of the expedition, truly, is the intangible accretion of knowledge of living things. And that, as the founders of the Zoological Society in their wisdom planned it, is the way it should be.

Telling the World

By MYRTICE BLATCHLEY

FROM THE very beginning, "Promotion of Zoology" has been one of the main objectives of the Zoological Society. As a "shotgun" objective it is admirable; comprehensive enough to encourage us in all sorts of experiments and innovations, specific enough to keep our feet on the ground and make us ask constantly: "Is this the best method we can devise to tell people about animals?"

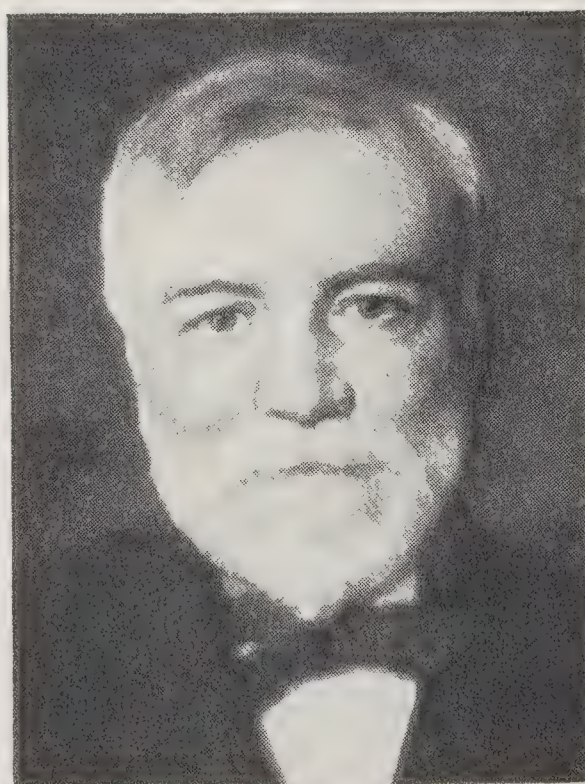
Many are the methods. Photography, publications, labels, visual aids distributed to the schools, guided tours, information services, radio, lectures, public address systems with "canned" talks. They have all been used, are being used, and the result has been a tremendous outpouring of information.

Despite the fact that some zoological parks—even some rather large ones—get along without a Guide to the collection, or publish only skimpy

ones, the New York Zoological Park started work on a Guide Book almost before there was anything for it to be a guide to. Director Hornaday

prepared copy for the first edition in the fall of 1899 (he wrote it during the tedious trips between his home and the Zoo), and it was published at 25 cents; simultaneously with the opening of the Zoological Park. The 3,000 copies were sold out during the winter and the second edition went to press in the spring of 1900. Thereafter the editions have followed in an unbroken stream and the Guide (now a board-encased volume of 258 pages, 162 illustrations, 75 cents) remains one of the most important educational contributions of the Society.

The need for the dissemination of zoological information through the medium of the printed word was soon felt, resulting in the addition to



ANDREW CARNEGIE
*Benefactor
of the Society*



Question House, opened in the center of the Zoological Park in the summer of 1945, has been an astonishing success as a means of "telling the world" about animal life. Almost every visitor, it seems, has one or more "animal questions" and is delighted at the chance to get a quick and authoritative answer.



Under the title of "What's New at the Zoo?" the Zoological Society and the Columbia Broadcasting System sponsored a series of more than two-score half-hour radio programs from the Zoological Park. Here a broadcaster is describing the speed with which a Giant Armadillo is able to dig itself out of sight.



This is the kind of "zoo lesson" that school children will always remember. The Zoological Society's Department of Education operates on the theory that information about animals truly "sinks home" when the children can see an animal at close range, perhaps can touch it, can see a demonstration of some of its special adaptations. While this magnificent Dromedary stood placidly in the center of the group, the Society's lecturer told the children of the Camel's importance as a beast of burden and transportation. They examined the soft, spreading pads of its feet, watched it get down and up again, heard it groan in the immemorial fashion of all Camels—in short, they learned by direct observation "how a Camel works."

the staff of Elwin R. Sanborn in 1901 and the subsequent formation of a Department of Photography and Publication.

Interesting sidelights on the development of photography can be gleaned from Mr. Sanborn's reports. At first all photographs were taken on glass plates which were sent downtown for processing. Some time later complete dark-room facilities were installed at the Zoo. In 1918 Mr. Sanborn mentions the development of celluloid film to replace glass plates and comments on the numerous attendant advantages of the new method, such as: faster speed, durability and the need for less storage space. He reports in 1930 the development of the first flash bulb by a German scientist and remarks, "As a substitute for explosive flash powders it is most valuable, as numerous horrible accidents have occurred from premature and unexpected ignition of various forms of powder, which, if they did not instantly kill the operator, often made disfiguring scars and caused long periods of intense suffering." He himself, had suffered from one such accident.

Since these early days, the Society's collection of animal pictures has grown until it now exceeds 23,000 negatives—probably one of the largest collections of animal pictures in the world. These are in great demand for use by teachers, artists, publishers, taxidermists, textile designers and the like. Recently some of the best of them have been made available in chart form at moderate cost.

From the first, teachers have been anxious to utilize the educational facilities of the Park and thousands of school classes have visited the Zoo in conjunction with their school studies. The Society has endeavored to cooperate with the school science program. Prior to the establishment of the Department of Educational Activities under Dr. Claude W. Leister in 1929, the entire scientific staff devoted considerable

time to educational activities. Talks and special demonstrations were given for visiting school classes, lectures were presented at the schools and conferences were held with the teachers.

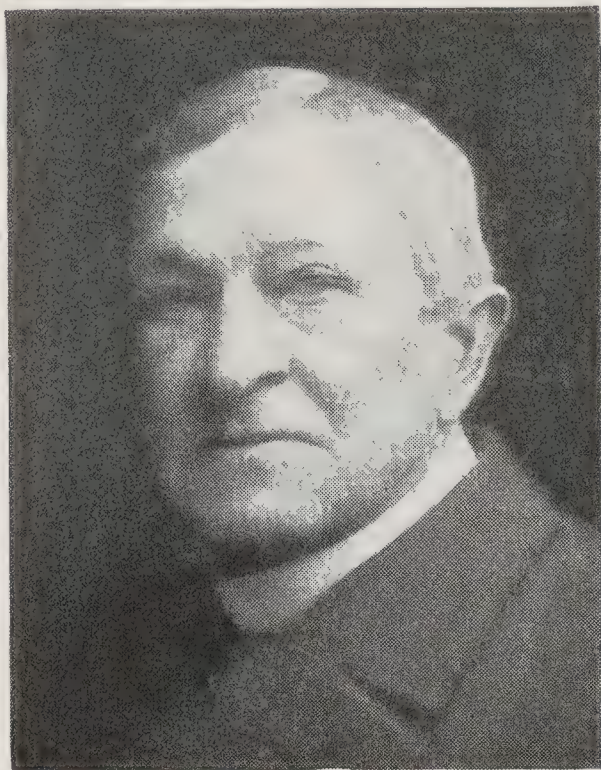
In 1907 the Bronx Borough Teachers' Association, through Prof. Hugo Newman, made an urgent request that a course of lectures about animals for the fifth grade classes be given at the Park. These were held in the large rustic Shelter Pavilion located near the Wolf Dens. A platform was erected, a stereopticon purchased and the interior of the improvised hall darkened with black curtains. Here, during regular school hours, three courses were given by Drs. Hornaday, Beebe and Ditmars to 3,500 pupils from 38 Bronx Schools. After the lectures, the pupils in small groups visited the live animals stressed in the talks.

Some years later, in 1925, at the suggestion of Mr. Irving K. Taylor, one of the Society's Trustees, weekly lectures for school children during the summer months were given in a special tent accommodating 500 children erected south of the Ostrich House in Audubon Court. Moving pictures were used to illustrate these talks by the Park staff. An auditorium is one of the important facilities we hope to acquire before too long.

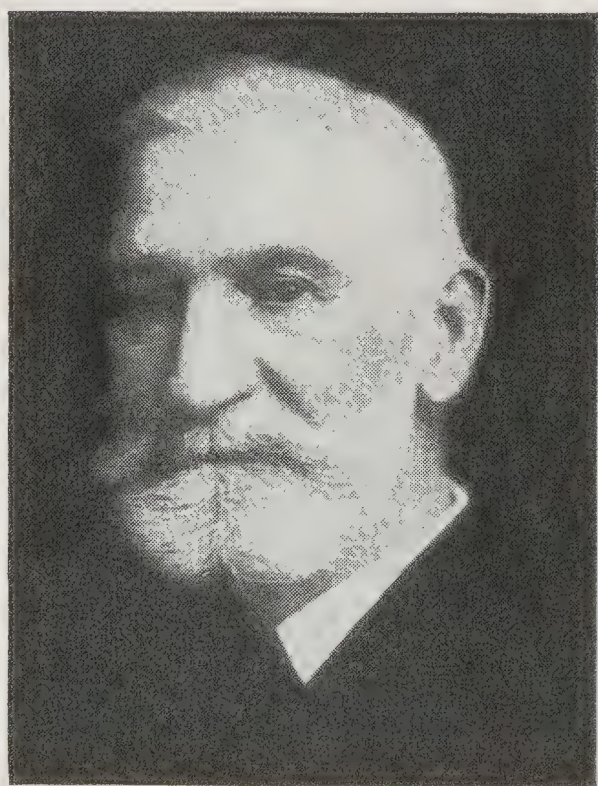
Much of the credit for furthering popular education in zoology should go to Dr. Raymond L. Ditmars. He probably did more to popularize the study of reptiles, especially snakes, than any other one person. He talked to many schools and other organizations in the Park

and outside. Many years ago he recognized the importance and interest of insects and he set up summertime exhibits. Panoramic backgrounds were designed for the reptile exhibits and special anatomical models relating to poisonous snakes were displayed.

His interests extended also to visual education and his series of forty-three natural history films



LEVI P. MORTON
President, 1897-1909



SAMUEL THORNE
*Vice-President,
1909-1916*

became well known and widely used both in the schools and in the theaters. In 1926, in recognition of his contributions to this field, Dr. Ditmars was appointed to the Committee of Visual Instruction in the New York City schools. In the radio he recognized another medium for popularizing zoology, the most satisfactory means for bringing the Zoo to a large public. He presented many radio programs, on one of them broadcasting the sound produced by a rattlesnake—an event which created great interest at the time. In addition he experimented with the use of phonograph records for presenting biology lessons.

With the establishment of an Education Department, many of these scattered activities were centralized and expanded. Visual aids in the form of hand colored lantern slides and, later, motion pictures, were produced and distributed free of charge to the public schools of New York City, a worthwhile and essential educational service which has been maintained for many years.

Guided tours were developed to assist the many school classes visiting the Park. A series of special school bulletins was prepared and distributed to classes as they entered the Zoo gates. The Zoo has been carried to schools and other

organizations by means of lecture services and special exhibits. For several years a representative of the Educational Department has visited the schools, taking live animals with her and giving popular talks illustrated with 2 x 2 Kodachrome slides. Special science courses for teachers and outstanding science students have been offered, lectures being given by various staff members.

What will the future bring in the realm of popular education in zoology? Without any doubt the next few years will see a tremendous expansion of the audio-visual education field with increasing emphasis on 16 mm. colored movies and the use of the small 2 x 2 slides and 35 mm. film strips, especially in color. Good recordings will play an increasingly important role in supplementing visual aid programs. Regular radio programs and the use of public address systems will also be extended. We expect to extend our series of interesting and authentic publications, and we feel the lack of organized courses about animals for teachers and laymen.

One of the biggest jobs of the Society in the future will be in the field of conservation education. The need for it is more glaringly apparent every year. This is a challenge and an obligation which the Society must meet.

Reading and Writing

By WILLIAM BRIDGES

A GLANCE at the "masthead" of this magazine reveals the earnestness of a policy laid down when the Zoological Society was founded: its aim was the "promotion of zoology through . . . publication"—and although the Society itself is only fifty years old, this year begins Volume XLIX of ANIMAL KINGDOM. One volume a year—and it is now entering its forty-ninth year of

continuous publication. When the young Society set aside funds for publication, it meant to publish vigorously.

The whole history of the growth and unfolding, the struggles and the triumphs, of a purposeful institution is reflected in the pages of the Society's magazine—first the BULLETIN, as it was called until 1942, then ANIMAL KINGDOM as it

became. Triumphant articles on the occupancy of a new animal building, on the capture and first exhibition of a rare animal; conscience-awakening indictments of game hogs and plumage hunters in the days when we were winning the fight to protect migratory wildfowl; campaigns against litter in the Zoological Park, exciting chronicles when our men returned from expeditions. The *BULLETIN-ANIMAL KINGDOM* surely has served well the purpose for which it was established.

It took just eight years after the opening of the Zoological Park for the staff to reach a point where the immediate tasks of building and collecting were on a routine basis and there was leisure for research. Up to then such technical papers as the staff had prepared—mostly pathological reports from the Veterinary department and observations on new specimens—had found an outlet in the Society's *ANNUAL REPORT*. By 1907 it was apparent that some journal of more immediate publication was necessary, and *ZOOLOGICA* was founded for purely scientific and technical papers. It appeared on an occasional

basis until 1936, when it was transformed into a quarterly. Now as in the past it circulates among institutions and individual scientists all over the world. Since 1907 *ZOOLOGICA* has published 391 technical papers totalling 6,178 pages, by far the greater part the work of the Zoological Society's own staff.

Except that fifty years is a long time, the outsider might wonder how the staff found time to manage and operate a Zoological Park and an Aquarium, for the writing of books would seem to have been a full-time occupation. Since 1906 when Dr. Beebe wrote his first book, the staff has fathered 66 books. All, naturally, on the subject of animals.

But however energetically they write, and however popular their works, the staff of the Zoological Park and the Aquarium can hardly give any lessons to the Society itself. Since 1899 its Official Guide Book has gone through 27 editions and has sold a total of 406,000 copies.

The staff, naturally, points out that the Guide Book has always been written by staff members!

In the Medium of Oils

By JOHN TEE-VAN

A PAINTING OF A Mammoth or a Sabre-toothed Tiger done by a contemporary artist would be a unique and priceless possession. To provide coming generations with paintings of important animals still alive but threatened in the near future with joining the shades of the Sabre-tooths, the Society in 1912 started to raise funds to pay for the perpetuation in oils of our more important mammals. By this action and through gifts from interested nature lovers, the Society through the years has acquired a magnificent collection of 40 oil paintings. The majority of these are by Carl Rungius — a great animal artist

thoroughly familiar with the anatomy and the habits of the animals he portrays and possessing intimate knowledge of the country where the animals lived. The gamut of America's principal game animals has been covered by Mr. Rungius, and to mention only a few, there are startlingly beautiful oils of our Bison, Moose, Prong-horned Antelope, Elk, various Bears, Wolves, Coyotes, Red and Gray Foxes, Lynx, Townsend's Fur Seal and Sea Elephants.

While the Society's Gallery of Wild Animal Paintings is composed primarily of portrayals of American mammals, there are notable exceptions.



One of the most striking of the many great animal paintings in the Society's gallery is "American Flamingos at Home" on Andros Island in the Bahamas, painted in 1921 by Louis Agassiz Fuertes. Since 1912 the Zoological Society has been collecting paintings, by the finest animal artists, of important species that are or have been threatened with extinction. The collection now embraces about forty canvases and eventually we hope to be able to show them to the public in a special gallery in the Zoological Park.

Chief among these are a superb painting of a lioness by Rosa Bonheur, two paintings by Louis Agassiz Fuertes including a striking one of American Flamingos at home on Andros Island in the Bahamas, a Jaguar and a Snow Leopard by Charles R. Knight, and others by R. Bruce Horsfall, Charles Livingston Bull, A Radclyffe Dugmore and George M. Sutton. The Society's

desire to have these paintings on exhibition where they may be seen by the general public so far has been frustrated because of space limitations. At present a considerable number can be seen in the Members' Room and the halls of the Administration Building, but it is hoped that some day a gallery will be available at the Zoological Park where this priceless collection can be shown.

An Approach Through the Sportsman

By JOHN TEE-VAN

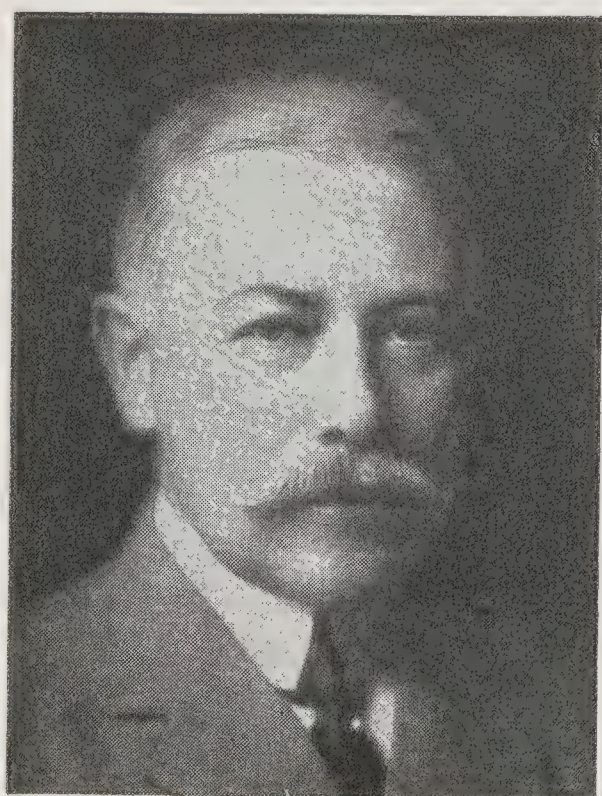
AMONG THE LIVING CREATURES of the earth the horn- and antler-bearing animals have always held a high place in the interests of nature lovers, sportsmen and the general public. Early man must have been filled with awe as he gazed upon the enormous antlers of an Irish Elk or the almost incredible tusks of a Mammoth or Mastodon; today we in turn are impressed with the somewhat smaller but still huge antlers of an Elk or Moose, and our appreciation of the beautiful is stirred by the semicircular scimitars of a Sable Antelope or a Kudu's spirals.

Man's recent rapid spread into the wilderness areas of the world has greatly reduced the living areas of the deer, goats and sheep, antelopes and the rest of the creatures that we loosely call "game animals." As a result many species have rapidly diminished in numbers, others are close to extinction, some have already gone over the border and live no more, and others live only because man has delivered them into semi-domestication.

Realizing that many species were vanishing

and that their heads might soon be unobtainable, the Society in 1906 established "The National Collection of Heads and Horns" for the express purpose of gathering together as complete as possible representation of the game animals of the world. Through the diligent efforts of Madison Grant and Dr. William T. Hornaday and the generosity of sportsmen, naturalists and animal lovers, the project materialized and grew to such an extent that in 1922 a special building—the Heads and Horns Museum—was erected in the Zoological Park to house the large and constantly expanding collection. As now shown and as originally planned, the collection is in two series—one showing the animals according to continents within which they live, and a second series showing the same animals according to their zoological affinities. Since its inception, one of the goals of the collection has been that the head representing each species should be a record

one. At present the number of high ranking heads is impressive and the material is at hand for a really dramatic display.



PERCY R. PYNE
Treasurer
1903-1922

Plans now are being worked upon to reorganize the Museum building and reduce the number of heads shown to a single head of each form or species instead of two or more as at present. This will lessen the confusion that is now so apparent. Other changes involve new lighting of the collection, the use of colored maps, diagrams and models wherever such are necessary to demonstrate relationships or other interesting aspects of the life of the animals, exhibits explaining how

horns and antlers develop, the differences between the two, and the use which animals make of them.

Many species and forms of animals are shown in the Heads and Horns Museum that cannot be exhibited alive in the Zoological Park; we are attempting, therefore, to create through labels and diagrams a closer interest in the public's mind between the living animals in the Park and those in the collection.

Fun in the Zoo

By LEE S. CRANDALL

FIFTY YEARS AGO Zoology was a serious subject, to be approached reverently and without levity. Today it is serious still but how different is the approach!

A Zoological Park deals with people *en masse* and of all degrees of zoological consciousness, beginning at zero. In dealing with and developing the dawning realization of the bare fact that there *are* different kinds of animals, there is nothing to equal the living creature. People will look at it, under any conditions. If they can be made to pause, if only for a few seconds, an impression must be made. That, of course, is the function of the "modernized" exhibit. The better it looks, the more lasting is its impact.

Once this initial break-down has been made, it is essential that dawning interest be fostered. Identifications must be accurate, labels must be abundant and correctly informative. People will read labels if the exhibit is sufficiently impelling. But no label in itself will make a poor exhibit into a "crowd stopper." It develops, then, that a Zoo must be equipped to carry its public from the most casual flicker of interest to the intensive investigations of the full-fledged scientist, with every intervening degree. This is exactly what

we are undertaking to do in our exhibits.

But to return to our original theme: the approach. In the old days, there was emphasis on dignity, with thumbs down on any hint of lightness. It would be unfair to lay the blame for this attitude on the authorities of those early times, for it was the attitude of the erudite in general. There was fear that, if we strayed from the accepted path, we might be marked with the stigma of a "circus" — in fact, we sometimes were so stigmatized! On the other hand, if we cannot blame our predecessors, we cannot take too much credit for ourselves. It is only that we are trying hard to keep up with the modern trend, which even then sometimes eludes us. The man with special knowledge or abilities is no longer a man apart. The level of awareness has risen greatly in fifty years. Where once we need depend only on the living state of our exhibits to draw our public, we now must compete with numerous other institutions of similar objectives, together with shop windows, the motor car, the radio and the movies. As they extend their drawing power, so must we.

We still are intent on spreading zoological knowledge and we still anxiously avoid the risk



To children of a certain age (and even to a few adults!) nothing is as much “fun in the Zoo” as an animal ride, and so we maintain two tracks for the amusement of our younger visitors. Children often pat a Camel or Elephant after their ride and then tell their parents, “Now I’ve made friends with it!”

of becoming a circus. But we have found, at last, that there is a pleasant mean. It turns out that laughing, happy people are not immune to the acquisition of learning. We have applied this principal with such diligence as we can command.

Our exhibits have been brightened as far as time, money and scarcity of materials will permit and this process will continue until we are on a new footing throughout. Our labels have been put on a face-to-face basis as far as we are able to do so without loosening our grip on our fundamental purpose. Our visitors are obviously appreciative. So far, so good. We know, now, that we can safely entertain and even amuse our visitors without lessening our teaching value. But we still have to make them come.

To this end we have installed certain devices, mostly by way of attraction for the very young. This works perfectly well, of course. We need to develop the interest of children at the earliest possible age. Usually, children despise being

dragged to centers of culture by determined mothers but the situation is reversed when it is a question of a visit to the Zoological Park. Children drag their parents who, we hope, are not entirely reluctant.

It is safe to say, without too much offense to hard-working colleagues, that the Children’s Zoo is our best entertainment. We cannot claim that the idea is original with us, for such installations were constructed in European zoos well ahead of ours. But we can claim improvements on the basic idea. The principal theme of the exhibits is the nursery rhyme, which still enjoys a great popularity in spite of the present feeling of child psychologists that life should begin in a world of reality rather than in one of fantasy. We really have a point here, I think. Young visitors view “Pussy’s in the Well” and “Baa-baa Black Sheep” with pleasure and amusement; it is the parents who take them seriously. Then, to balance any possible reversion to an older school, the animals themselves are very real. There are



The Children's Zoo has turned out to be a really important adjunct to the education of city children—often it is their first means of contact with a living animal. And it is truly a “children's zoo,” for it is one of the strict rules of the operation that no adults shall be admitted unless accompanied by a child!



The “Hay Wagon Taxi” between the center of the Zoological Park and the Farm-in-the-Zoo a mile away started out to be merely a convenient means of transportation, but the novelty of being pulled by horses (in an automobile age) is so great that the Hay Wagon is now a pleasure-giving device in its own right.

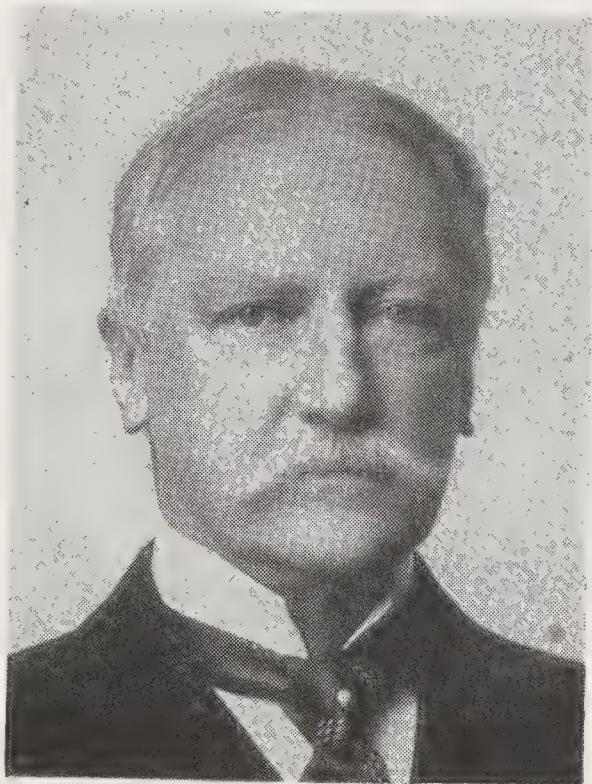
living kittens in the "Well," and really black sheep have been achieved at last. And the close contact with tame ducks, geese, bantams, rabbits and Petunia, our charmingly tame skunk, removes any possible vestige of fantasy.

As with all of our facilities of this nature, we spare no trouble or expense to achieve the best possible operation. Very often the Children's Zoo provides the first contact of the child with a living animal, an event that may be of far-reaching consequence. Our attendants are always ready to give the special attention often required to make certain that this all-important introduction shall be psychologically pleasant.

Next in importance to the Children's Zoo are the Animal Rides.

These are conducted as two separate operations, in one of which ponies furnish the transportation, while such other beasts of burden as we can provide are utilized in the second. Pony rides, of course, have been popular almost from our very beginning and at various times both dromedaries and elephants have been used, though with indifferent success. Both ride installations, we think, are now operated on a better basis of friendly contact than could be achieved in earlier days. The Animal Rides are somewhat handicapped, at

present, by the fact that only donkeys, llamas and a single hybrid camel are available. We are now making arrangements to add riding dromedaries and possibly elephants.



**JOHN L.
CADWALADER**
*Vice-President,
1902-1915*

Last but definitely not least comes the Farm-in-the-Zoo. Something of a stepchild because of the present inaccessibility of its habitat, this facility has a potential educational value that will come into its own with projected development of the nearby area. The Farm offers opportunity for contact with domestic animals often entirely unfamiliar to city children, as well as an array of pure-blooded stock that satisfies the best-informed visitor.

The Hay-ride, originally conceived as a purely utilitarian means of transport to the Farm, has developed into a pleasure-giving device in its own right. City people are entranced by the opportunity to ride in an authentic hay wagon, their feet deep in the sweet-scented product of the meadow, behind a handsome pair of farm horses.

So, then, we combat the lure of more mundane amusements. We think we are doing so with some success. We have every evidence that the public has fun in the Zoo — and that it acquires a substantial amount of knowledge while it is having the fun.

New Ways to Old Ends

By **FAIRFIELD OSBORN**

ONE OF THE easiest errors that can be made in planning improvements is to throw away the values of the past. This would be a particularly unhappy mistake in the case of the Zoological Park because its original plan was so finely conceived, the use of the terrain so well thought out, and most of the buildings even from today's

viewpoint of such excellent design. But time brings its own changes, and new methods suggest themselves. It is with these that we are now concerned.

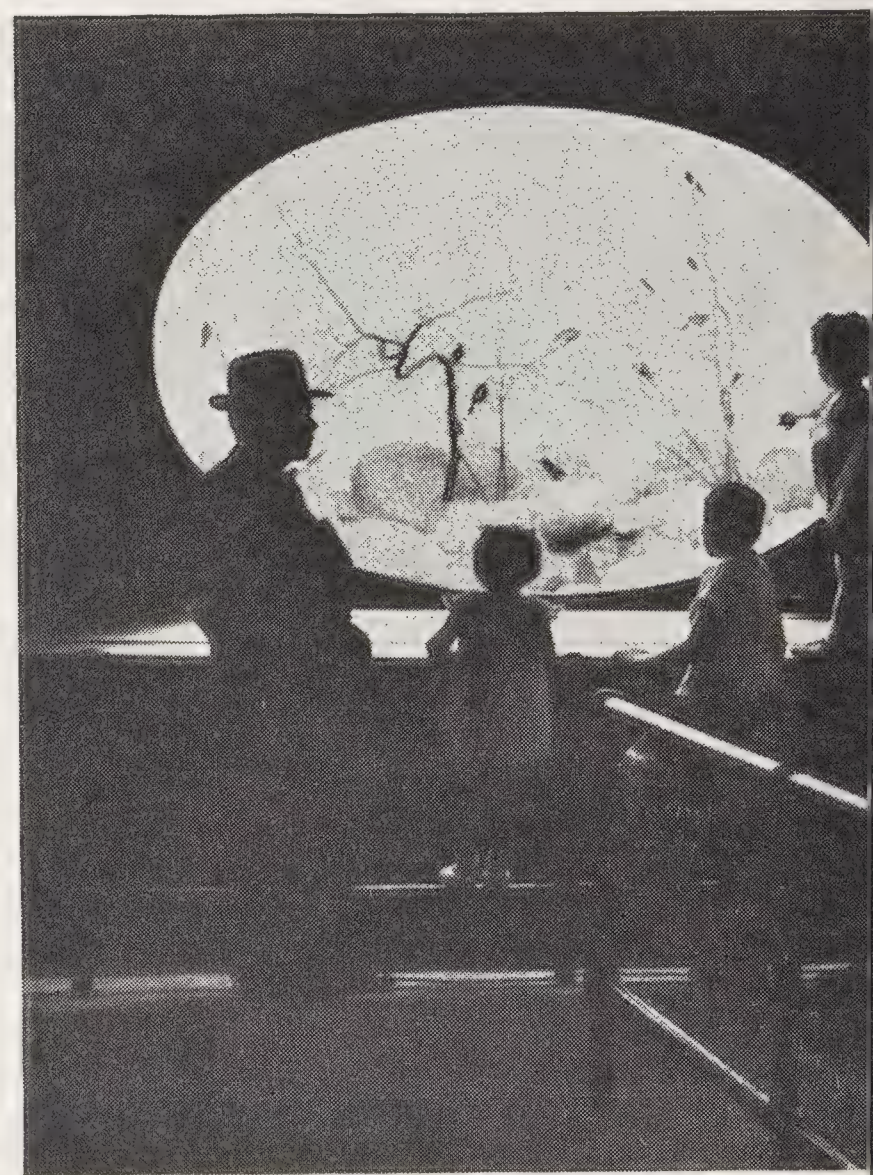
Two principal motives lie behind the improvements that have been made in recent years and have guided us in the preparation of the exten-



New ways of thinking, new approaches to problems of presenting animal life effectively and dramatically, have resulted in many striking new exhibits in the Zoological Park.

LEFT—Typical of the habitat planting in the Bird House is this section of the Desert scene suggestive of the birds' actual environment.

BELOW—A corner of the Jewel Room where the public, from the darkened center, views tropical birds in illuminated compartments.



sive post-war program. The first is to create areas that are considerably more expressive of the animals' natural environment; the second is to provide the public with means of gaining a greater understanding of the wonders of animal life.

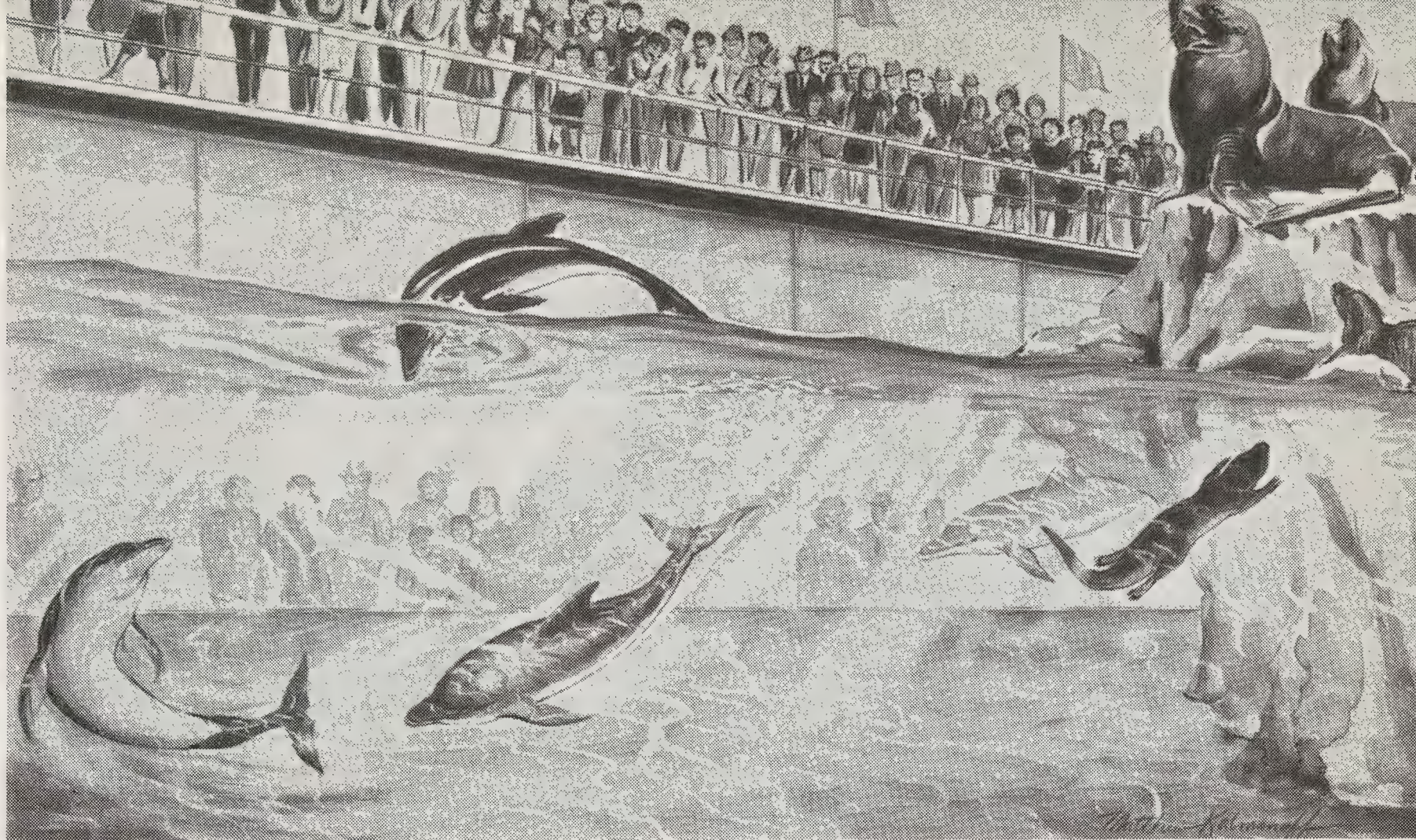
In regard to the creation of more natural environments, a highly successful beginning was made through the establishment of the African Plains and lion exhibits. Although these two units were opened just before the war started, public interest in them continues unabated. Further, the animals seem more contented, breeding results are excellent, and the installation has proved itself entirely practicable from an operating point of view. Consequently, the development program includes the creation of many similar exhibits.

A basic theme is being followed wherever possible throughout the entire future program. This

will result in the grouping of representative animals of the various continents, and thereby the public will gain a clearer idea of the animal life of any given continent and the inter-relationships of societies of animals. Further, a visitor can plan the day more intelligently by making a trip to "Asia," or "Africa," or to "North America," rather than by viewing a miscellany of unrelated groups scattered here and there throughout the Park. Obviously this plan, like any other, cannot be adopted exclusively. It is especially applicable in the showing of large mammals and ground birds out of doors and can be used partially within buildings for exhibiting collections of small mammals, birds, reptiles and insects. On the whole we believe it will give greater meaning to the wonderful and diverse array of animal life.

It has proved possible to create natural as well as geographical backgrounds in exhibits through-

IT—There is nothing stereo-
about our plans for a new
rium, for the whole emphasis
e exhibits is on the activity and
relationship of the life of the
s. This is an artist's sketch of
of the two great out-of-doors
as we now plan them. Visi-
may watch the aquatic animals
from above and from below
waterline, indoors and outside.



Attractively
printed labels,
carrying pictures
when necessary,
make it easy for
visitors to gain
information
about the
exhibits in the
Zoological Park.



out the Zoo in a way that had not previously
occurred to us. Examples of this technique can
be seen in the changes that have been made re-
cently in the Reptile House as well as in the
Bird House. In the latter case the long south
hall has been converted into large, beautifully
planted flight enclosures, where there are shown
collections from the Indo-Malayan region, the
rain forests of Central America, eastern North
America and so forth. Perhaps the most striking
exhibit is the new Jewel Room in the Bird
House, which was opened in the Spring of 1945.
Here we have probably accomplished the best
job so far in the use of light and color.

Constant experiments are being made in the
use of light and color. We have found that cer-
tain color tones lend themselves far more effec-
tively to the dramatic showing of animals than
do others. This is evident in the Bird House and

also in some of the mammal buildings. Some-
times a simple idea works wonders as in the case
of the big pool of the Sea Lions. The speed and
grace of these animals *underwater* are among the
extraordinary sights in nature. Due to the fact
that the basin of the pool was a dark gray color
the animals were lost to view as soon as they
submerged. Last autumn the entire basin was
painted with a specially prepared blue-white
paint containing no harmful constituents. The
result is complete visibility of the underwater
movements of these remarkable animals — thus
adding immensely to the interest in an ever-
popular exhibit. From time to time we have en-
gaged the consulting services of technical light-
ing experts, especially in connection with the
Aquarium exhibits. Modern techniques have
their place in a zoo as well as elsewhere.

In regard to the second principal motive that

is back of our planning these days — making the Zoo more informative and educational — we have run into some stimulating experiences. One of the first tasks that was tackled several years ago was that of improving the descriptive labels — a serious problem of all zoos and museums. While the general standard of labelling in the Park has always been good, it seemed apparent that improvement could be made by getting more of a story into each label, high-spotting some particularly interesting fact. Also it was a “must” that every specimen should be described. The old hand-painted labels were discarded and a new technique of printing labels was developed. These are informative and entirely legible. The task has been laborious because there are always considerably more than a thousand labels in circulation, but the improvement has added immensely to the public interest in the animals themselves. A while ago we went a step further and began to experiment with lengthy descriptions in order to find out how much the public would really take. For example, special exhibits such as the Lungfish and the Common Eel were installed in the temporary Aquarium exhibits,

with long informative texts regarding life habits and so forth. Visitor reaction is more than favorable. It is a gratifying sight to see groups of people reading and discussing the facts that are presented. Consequently we intend to carry this idea much further throughout the Zoo in the future. The truth is that a Zoo can and should become a real educational center. In this connection, the Question House, which was opened in the Spring of 1945, has justified itself completely. We opened this with a feeling that it might be too “highbrow.” On the contrary, it is meeting a real need.

Other ideas have suggested themselves as we have gone along — ideas that make the Zoo not only more instructive but also more lively and more generally enjoyable. In this category are new attractions such as the Farm-in-the-Zoo, the Children’s Zoo, the tractor trains of World’s Fair fame, varieties of animals for the riding tracks and improved restaurant and food services.

The long and short of it is that these efforts and experiments are really one grand adventure. The animals themselves are the challenge. How to do them justice? That is the eternal question.



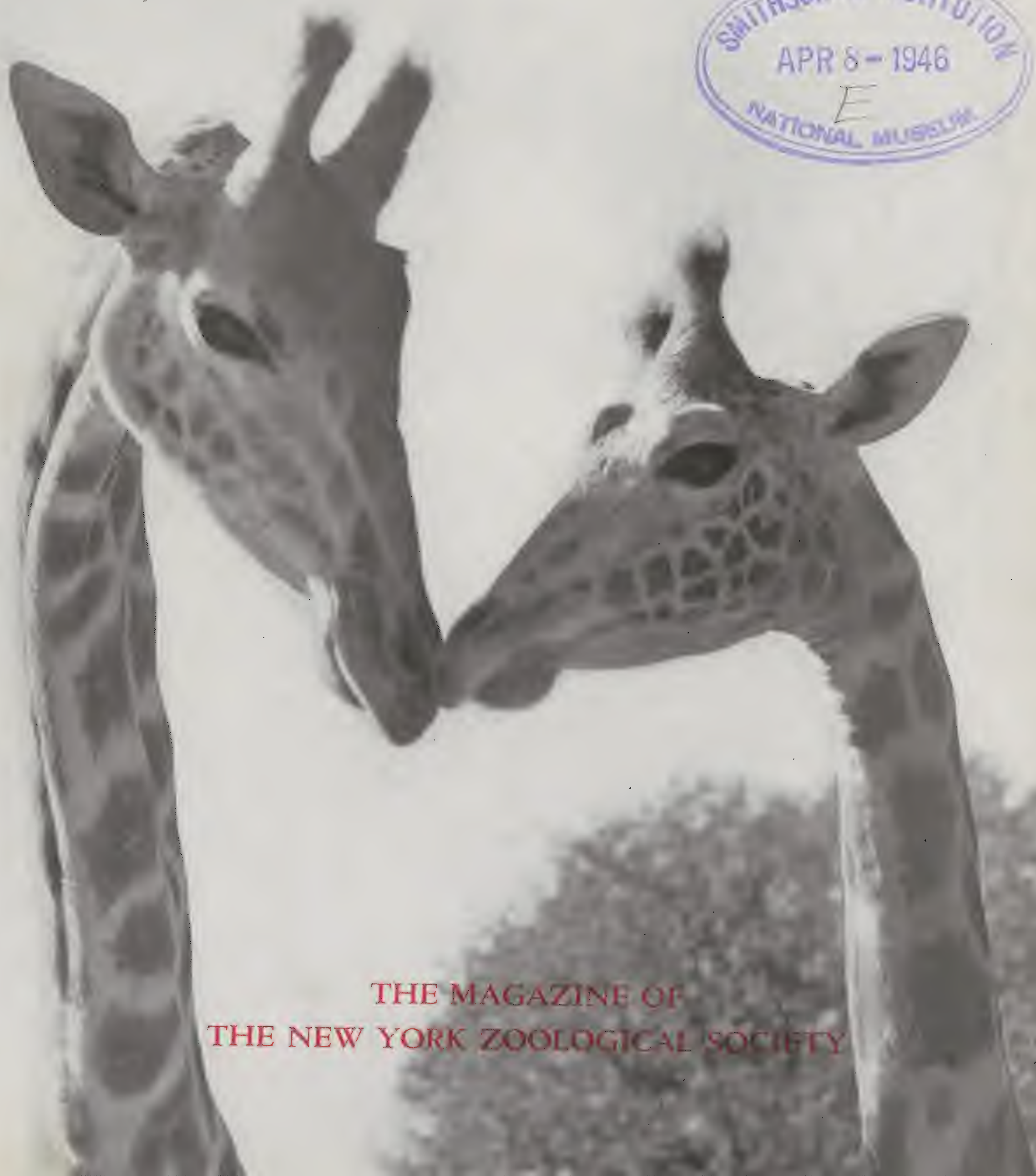
Such idyllic scenes as this, on the African Plains section of the Zoological Park, point the way to many future developments. The Zoological Society is determined to extend wherever possible the “continental” type of exhibit and to remove the animals from behind the bars to natural, open, moated enclosures.

XLIX • No. 2

MARCH - APRIL, 1946

510,000
A59

ANIMAL KINGDOM



THE MAGAZINE OF
THE NEW YORK ZOOLOGICAL SOCIETY

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York 20, N. Y.

PRESIDENT
Fairfield Osborn

FIRST VICE-PRESIDENT
Alfred Ely

SECOND VICE-PRESIDENT
Laurance S. Rockefeller

SECRETARY
Harold J. O'Connell

TREASURER
Cornelius R. Agnew

EXECUTIVE COMMITTEE
Laurance S. Rockefeller, *Chairman*

Cornelius R. Agnew
Alfred Ely
De Forest Grant

Warren Kinney
William De Forest Manice

David H. McAlpin
Robert Moses

Harold J. O'Connell
Fairfield Osborn
J. Watson Webb

BOARD OF TRUSTEES

Class of 1947

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez

De Forest Grant
Eugene Holman
Warren Kinney

Henry R. Luce
William De Forest Manice
Harold J. O'Connell

Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1948

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely

Marshall Field
Childs Frick
Archer M. Huntington

David H. McAlpin
John H. H. Phipps

Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Class of 1949

George C. Clark
F. Trubee Davison

Jay Downer
Robert I. Gannon

Robert Gordon McKay
Fairfield Osborn

Laurance S. Rockefeller
John M. Schiff
Frederic C. Walcott

Ex-Officio, The City of New York

The Mayor, Hon. William O'Dwyer

Commissioner of Parks, Hon. Robert Moses

STAFF

GENERAL

John Tee-Van	<i>Executive Secretary</i>
Jean Delacour	<i>Technical Adviser</i>
William Bridges	<i>Editor & Curator, Publications</i>
Myrtice A. Blatchley	<i>Associate in Charge, Department of Education</i>
Herbert F. Schiemann	<i>Comptroller</i>
Sam Dunton	<i>Photographer</i>

ZOOLOGICAL PARK

Lee S. Crandall	<i>General Curator</i>
Brayton Eddy	<i>Curator of Reptiles & Insects</i>
Edward Kearney	<i>Manager, Facilities Dept.</i>
Quentin Melling Schubert	<i>Superintendent, Construction and Maintenance</i>
W. Reid Blair	<i>Director Emeritus</i>
Leonard J. Goss	<i>Veterinarian</i>
Grace Davall	<i>Assistant to General Curator</i>
William Beebe	<i>Honorary Curator, Birds</i>

AQUARIUM

Christopher W. Coates	<i>Curator and Aquarist</i>
Ross F. Nigrelli	<i>Pathologist</i>
Myron Gordon	<i>Assistant Curator</i>
C. M. Breder, Jr.	<i>Research Associate in Ichthyology</i>
George M. Smith	<i>Research Associate in Pathology</i>
Homer W. Smith	<i>Research Associate in Physiology</i>

DEPARTMENT OF TROPICAL RESEARCH

William Beebe	<i>Director</i>
Jocelyn Crane	<i>Research Zoologist</i>
Henry Fleming	<i>Entomologist</i>

Associates

William K. Gregory
John Tee-Van

Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

VOL. XLIX

APRIL 4, 1946

No. 2

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York 20, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York 60, N. Y. Title registered with United States Patent Office.

Subscription, \$2.50 a year; single copy, 50 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

THE URGENCY OF CONSERVATION EDUCATION

As President of the New York Zoological Society, Fairfield Osborn conducted the "Conservation Education" session of the Eleventh North American Wildlife Conference at the Hotel Pennsylvania on March 12. Mr. Osborn said:

THERE ARE two major threats in the world today, either one of which would cause incalculable loss of human life, if not the break-down of the entire structure of our civilization. The first is the misuse of atomic energy. Everybody everywhere knows about that now so presumably steps will be taken to ward off that perilous danger. The other is the continuing destruction of the natural living resources of this earth. This great conference of conservationists from all parts of North America is being held in order to help ward off this second incredible threat to everything that is alive on the earth. Human beings, wildlife, forests, soils, water sources, are all in the same basket. Let's not fool ourselves. The Good Earth may be able to get along without man — as a matter of fact, it did successfully for many long ages, and could again today. But man cannot get along without the Good Earth, and when I say Good Earth, I mean all the natural living things on this earth, the things that conservationists refer to as renewable resources — forests, animal life, soils and waters. Every conservationist knows that these are one and all inter-related and interdependent. But the public does not know this fact; the industrial corporations don't know this fact; the legislators don't know this fact — except for a few of them. The truth is our government and other governments give no evidence that they actually realize what is going on, or, let us say, realize the extremity of the seriousness of the situation both here and in other countries.

The third of the Four Freedoms, "Freedom from Want"; Dumbarton Oaks; the San Francisco Conference; the U.N.O. meetings — all of these reachings of the human mind and spirit for

Continued inside Back Cover

IN THIS ISSUE

Two Tall Fellows	Ylla	COVER
It Was Rugged for Wildlife, Too	Ira N. Gabrielson	55
What Will the Atomic Bomb Do to Wildlife?		59
Bringing Up Benny	Lee S. Crandall	61
Footnote to Darwin	Myron Gordon	65
Newcomers from the Gold Coast	Brayton Eddy	68
The Carefree Life of a Baby Gibbon		70
The Electric Eel Went to War	William Bridges	73
An M.D. Looks at Conservation—and the Zoological Society	Alan Gregg	76
Petunia and Jeffrey Visit School		79
That's What We're Here For!	Donald T. Carlisle	82
Behind the Scenes: News and Notes		84

APR 9 '46



Courtesy Izaak Walton League of America

THOUSANDS OF DEAD FISH drifted ashore along the Scioto River at Columbus, Ohio, when the waters were polluted by the war production wastes of many factories and the overloading of existing sewage treatment plants. In war time, all natural resources take a beating, no matter who wins the war.

It Was Rugged for Wildlife, Too

By **IRA N. GABRIELSON**
*Former Director,
Fish and Wildlife Service*

NOW THAT THE WAR IS OVER, we can begin to assess its effects, both direct and indirect, upon wildlife throughout the world. Probably it will be a long time before we are able to appraise these effects accurately but a review of the things that are now known may give us some indication of the extent of the damage and suggest what must be done to overcome it.

Some of the more obvious things, and the ones to which conservationists' minds naturally turn, are the direct effects of combat activities. Probably we will never know the whole story, but occasional comments appearing in the press and reported from interested conservationists both in and outside of the armed forces indicate very clearly that there were many things that immediately disturbed wildlife. There were a number of reports in the press of the finding of dead whales, indicating a mortality of these huge mammals from depth bombs and from machine gunning. Sometimes they were perhaps honestly mistaken for submarines, and at other times, they merely furnished an animate target for somewhat "trigger happy" young men. Included in this latter class were the occasional machine gunnings of bird colonies which took place even on refuges. In fairness to the armed services, it must be said the ranking officers usually did everything possible to discourage and limit these activities, and abuses were largely the acts of more or less irresponsible individuals. There were some occasions, unfortunately, where local commanding officers encouraged such activities by their example if not by other methods. It should be pointed out that putting a man in uniform does not necessarily increase his standards

War probably exterminated certain species of birds, but the effects were "spotty" and not always what would be expected.

of citizenship or his knowledge of the necessity of conserving our natural resources. However, we have found that men who were intelligent citizens, understanding conservation problems, usually became officers with the same understanding and interest. On the other hand, those who had game hog tendencies were irresponsible and interested only in increasing their own opportunities for killing, and took every advantage of wartime conditions. The total results of this type of activity are exceedingly hard to appraise, since the damages were usually confined to localities where officers were not interested or careful, rather than over extensive areas.

One wartime effect which was widely publicized when it happened was the destruction of birds by oil discharged by merchant vessels at sea or released into the water by the sinking of tankers or oil-burning vessels by submarine activities. There were a number of such reports, mostly along the Atlantic Coast from Nova Scotia to North Carolina, and many thousands of birds were unquestionably destroyed. It is surprising that this type of mortality was not substantially greater than sometimes occurs under peacetime conditions. Perhaps this is accounted for by the fact that the peak of the submarine warfare along the Atlantic Coast of this country came after the majority of the more northern birds had returned to their summer homes.

There were also reports of losses of birds of

various species in the North Sea and similar stories from the Alaskan Coast. In most instances the extent of the area and the numbers of birds killed were hard to verify because most of the incidents occurred in places where there was little human habitation. Altogether, the effect of oil on aquatic life was considerably less than might have been expected when the extent of the sinkings and the amount of oil spread over the surface of the waters are taken into consideration. This was due, however, more to luck than to any other factor.

The occasional killing of fish by depth bombs has aroused some comment but the truth of the matter is that the effective range of such explosions is so limited that, unless spawning areas are subjected to continuous or frequently repeated dropping of bombs and explosives, the total effect on fish populations is insignificant.

Intensification of commercial fishing pressure on areas close inshore in some localities has undoubtedly had some adverse, but as yet immeasured, effects on the fish. On the other hand, the reduction of fishing pressure in other areas has been beneficial. For example, the almost complete stoppage of fishing in the North Sea during the war is now resulting in increased catches of fish with the same amount of effort.

The war has also brought about a use, at least temporarily, of fish and other marine forms that had been used sparingly or not at all in this country. If their use can be maintained, the result will be a better balanced fishery and a diffusion of the fishing pressure over many species instead of a concentration on a few forms.

Wartime restrictions on travel, rationing of tires and gasoline, and shortage of ammunition, have affected the wildlife populations. The general consensus of competent observers is that the combination of these factors has resulted in an increase in resident wildlife in areas remote from population centers and in a decrease, perhaps in the same resident species, in the vicinity of cities and in major industrial areas. The total effect has probably been a temporary increase in the populations of big game and, to a lesser extent, of the small game animals.

Against this increase is a new factor, only now coming into play, which is nevertheless a direct result of war. This factor is the increased hunting pressure which is developing with the return



Courtesy Fish and Wildlife Service

OIL DID THIS TO A LESSER SCAUP DUCK

of service men to this country. It is too soon to say how great this increase will be since the hunting seasons were over in many sections before any considerable number of men had been discharged. For this reason, it is probable that the increase will not become completely measurable until after the next hunting season. The only measure yet available is the increase of "duck stamp" sales. The increase in the season for 1944-45 over the previous year was approximately three hundred thousand, and sales up to January 1, 1946, in the 1945-46 waterfowl season indicate another probable increase of equal magnitude. If this increased interest in hunting and fishing follows the pattern of the previous World War, there will be no corresponding decrease in the years to come and a permanently increased hunting pressure on all of the species classed as game may be anticipated.

Another activity which caused much concern in the early days of the war was the use of wild lands for bombing and target ranges. Nearly a million acres of land in the Federal refuge system were used in some way for training purposes by the military forces. So far as the wildlife is concerned, it showed an unexpected ability to adjust to these disturbances and therefore the use of the lands, with some exceptions, did little permanent damage. Birds were disturbed somewhat by low-flying planes but except where permanent airports were constructed adjacent to refuges, there has been no more serious effect than



Courtesy Fish and Wildlife Service

ROWS OF EIDER DUCKS, KILLED BY OIL POLLUTION, ON THE BEACH AT MARTHA'S VINEYARD

the temporary disturbance of birds on the areas. With the exception of geese and cranes, waterfowl show a marked ability to adjust themselves to the presence of aircraft.

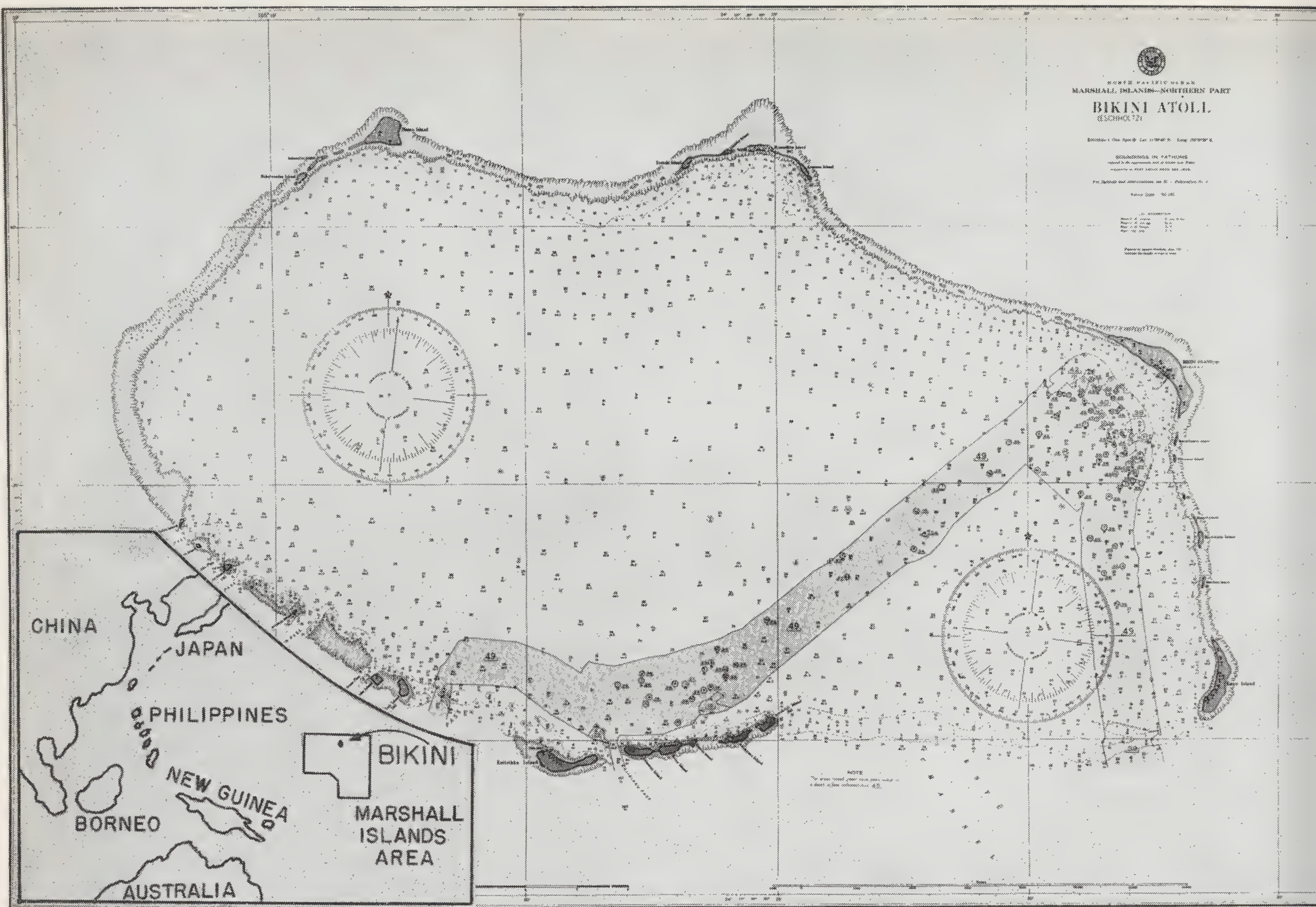
Many of the lands taken over by the armed services are now being restored to private ownership or are being made available for public use. Several of the areas can be well adapted for wildlife purposes. These can, to some extent, offset the permanent damage done to wildlife habitat by the necessity for large and hurried industrial and military developments in this country. There was a strong tendency to fill in marsh areas as the quickest way to get airfields, bases, depots, et cetera. For some reason, a marsh seems to exercise an irresistible attraction to engineers as a place where they can push dirt around to make new land. Many marshes have been lost permanently on the Atlantic Coast. To a lesser extent the Pacific Coast marshes have been destroyed or reduced by filling. Some of this loss may be compensated for by the acquisition of lands taken over by the armed forces and their development as wildlife areas, particularly marsh land. This is difficult to do under the present surplus property disposal act but some way must be found to overcome the losses in permanent habitat.

The hurried construction of billions of dollars' worth of war production plants and the development of new chemicals and new chemical processes on a large scale have introduced new and sometimes very destructive pollutants into our waters. As these plants have spread into

areas not previously developed industrially, waters that were formerly clean have become polluted. This is one of the major bad effects of the war program. It has undoubtedly set the "clean stream" program back many years. Much progress had been made in the decade prior to the war in stopping new pollution and cleaning up many previously polluted waters. Now in too many cases the job must be started over again.

There is another and as yet unappraisable damage which has undoubtedly taken place. Experience has shown that in actual combat areas on the continents the effects on wildlife populations are usually local and of no lasting importance. There is increasing concern, however, and a great volume of evidence, that this is not true of the wildlife in the South and Central Pacific island areas that were subjected to heavy bombing and bombardment. Unquestionably, some species of birds, mammals and perhaps other forms that were found only on some of these smaller islands have been entirely exterminated. Others have been so greatly reduced as to make it unlikely that they will ever be able to return to their former numbers. The best example is the Laysan rail, a small flightless species found on Laysan and Midway Islands, which has been entirely exterminated. It disappeared from Laysan Island years ago and probably the remaining ones on Midway have now been destroyed.

Continued on Page 88



WHEN THE ATOMIC BOMB IS EXPLODED THIS SUMMER, BIKINI ATOLL WILL CEASE TO EXIST

DOOMED

WHEN THE Navy makes its test of the atomic bomb over Bikini Atoll, in the Pacific, this summer, it is entirely likely that every living thing in the area will be annihilated at the instant of the bomb's explosion.

What forms of wildlife are doomed?

According to the latest records, we can expect the destruction of resident populations of the following:

Insects:

Not recorded.

Fish and Shellfish:

As on and around other islands of Micronesia.

Land Birds:

Oceanic Imperial Pigeon (*Ducula pacifica*).

White-browed Rail (*Poliolimnus cinereus*).

Sea Birds:

Reef-egret (*Egretta sacra*).

Crested Tern (*Thalasseus bergii*).

Black-naped Tern (*Sterna sumatrana*).

Fairy Tern (*Gygis alba*).

Common Noddy (*Anous stolidus*).

White-capped Noddy (*Anous tenuirostris*).

Wedge-tailed Shearwater (*Puffinus pacificus*).

White-tailed Tropic Bird (*Phaeton lepturus*).

Brown Booby (*Sula leucogaster*).

Pacific Man-o'-War (*Fregata minor*).

Occasional:

Migrant ducks from the north.

From this list it appears that while the local populations of a number of interesting birds will be wiped out, no entire species stands in danger of extermination by the explosion of the atomic bomb.

What thought the Navy has given to the biological aspects of the bomb test will be seen in Admiral Blandy's letter on pages 59-60.

What Will the Atomic Bomb Do to Wildlife?

An Exchange of Letters About the Bikini Atoll Test This Summer

NEW YORK ZOOLOGICAL SOCIETY

February 6, 1946

Dear Jim:

Because of a number of inquiries we have received, and our own interest in the matter, can you advise me as to what studies, if any, have been made by biologists concerning the anticipated destruction of marine and other natural life in and around the areas to be used for the Naval atomic bomb tests?

I hope you will agree that this is more than a theoretical question because to the uninformed it looks as if extremely widespread damage to the life of marine areas might result, with possibly the destruction of species of animals which could never be replaced. From the point of view of those interested in conservation, there is a feeling that the destruction caused by the war to wildlife and other elements of nature has been so widespread that every effort should be made to control any such further destruction during peacetime.

Any information that you can give me concerning the above inquiry will be greatly appreciated.

Sincerely yours,

s/ FAIRFIELD OSBORN,

President.

Honorable James Forrestal
Secretary of the Navy
Washington 25, D. C.

THE SECRETARY OF THE NAVY

Washington

February 12, 1946

Dear Fair:

The question you raise in your letter of the 6th of February about the destructive effects of atomic bomb tests on deep sea species has already been raised and I agree with you that it is a serious one. I am going to ask Vice Admiral Blandy, who is the party in charge of this project, to write you himself as to steps that he thinks can be taken to minimize the possibility of extensive damage.

Sincerely yours,

s/ JIM,

James Forrestal.

Fairfield Osborn, Esquire
New York Zoological Society
630 Fifth Avenue
New York City, New York.

* * *

JOINT TASK FORCE ONE

Washington 25, D. C.

My dear Mr. Osborn:

The Secretary of the Navy has asked me to write to you concerning the steps which have been taken to minimize the threat to marine life of the forthcoming tests with the atomic bomb to be conducted by Joint Task Force One under my command.

Essentially the only significant step which can

be taken in this regard is to be found in the selection of a site for the test. In view of the site selected, it is felt that actual damage to marine life will be very small and that the scientific information of an oceanographic and biological nature to be derived from the tests will far outweigh the damage done.

One of the factors which were carefully considered in choosing Bikini Atoll for the tests was the probably small population of living organisms and the absence of commercial fisheries in the Bikini region. Because of the small concentration of nutrient salts in the surface water layers of the Central Pacific north of the counter equatorial current (see for example Sverdrup-Johnson-Fleming, "The Oceans" p. 239), the phytoplankton population is low and hence can support only relative small numbers of other organisms. Although damage to organisms cannot be avoided, it is believed that this will largely be confined to animals and plants living in the Atoll since diffusion and decay of radioactive material will probably be sufficiently rapid after the contaminated waters leave the atoll to prevent extensive damage to pelagic organisms.

It is felt that from the biological point of view the scientific result of the tests may be of considerable value. Significant mutations, perhaps even resulting in ecologically stable new types of organisms may occur and they will be carefully looked for. In addition, the rates of repopulation and re-establishment of ecological equilibrium are obviously of wide biological interest. Thus, from the biological point of view, the tests may perhaps be considered as a large scale controlled experiment which may throw light on evolutionary processes.

To obtain information prior to the atomic bomb tests on the biota of the area we have already sent the U.S.S. BOWDITCH with a group of civilian scientists aboard to make an oceanographic, biological and geographical survey of Bikini and two other atolls, namely, Eniwetok and Rongerik. Intensive studies of the pelagic fisheries are included in the biological portion of the survey. The plans for the investigation were prepared in consultation with the U. S. Fish and Wildlife Service, the U. S. National Museum and the U. S. Geological Survey, and equipment and personnel were pro-

vided by these and other scientific agencies. This survey, besides providing a standard for estimating damage to plant and animal life, will of course make a significant contribution to the natural history of the area.

Surveys will be repeated by the same personnel as soon as possible after the bomb tests to establish the character and extent of immediate damage to life on and near Bikini. Rongerik has been included in the survey to provide a control area in which the possibility of damage is very slight. Eniwetok, being located down current, may show some effect of air or water-borne by-products of the explosions. It is hoped that surveys can be made at longer intervals for several years after the tests to study the rates and mechanisms of repopulation.

The survey party on the U.S.S. BOWDITCH is to make careful estimates of the population of plants and animals on the land, in littoral and reef environments, in the lagoon and in the surrounding oceanic waters. Pelagic fishes and plankton as well as benthic organisms will be studied. The survey party will also make a careful search for plants and animals which may be peculiar to the area.

Provisions are being made to assist the civilian specialists in working up the material collected by the survey and it is expected that the scientific results will be issued in a special series of oceanographic reports to be published by the newly-established Oceanographic Division of the Hydrographic Office.

Besides providing a large amount of original material on the area, the surveys should determine the extent of damage to the plants and animals. As mentioned above, it is hoped that the three atolls can be examined at intervals for several years to determine the possible long-term effects of the blasts and the mechanisms of repopulation.

I trust that this will answer the questions you have raised.

Very truly yours,

s/ W. H. P. BLANDY,
Vice-Admiral, U. S. Navy
Commander, Joint Task Force One.

Mr. Fairfield Osborn
New York Zoological Society
630 Fifth Avenue
New York City, New York.

Bringing Up BENNY

By
LEE S. CRANDALL



WENDY STANDS GUARD over the infant Benny (or Benita) on an island in the Sea Lion Pool. At this stage, when Benny was very young, the pup was in danger of drowning if it fell into the water.

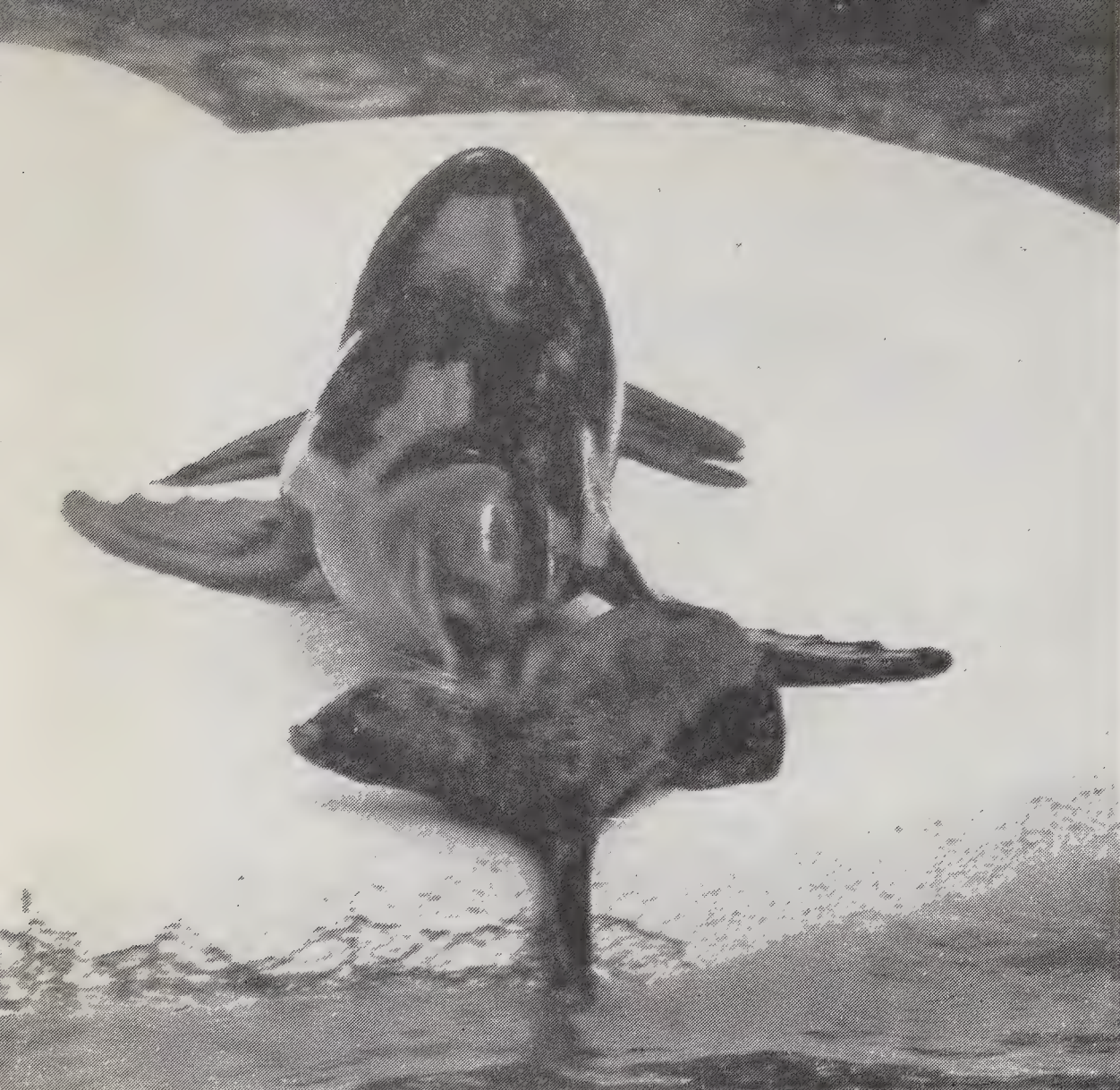
BENNY'S BIRTH was a surprise. Perhaps not to Wendy but *certainly* to us, for we had not considered such a possibility. We knew our Sea Lions were in uncommonly good condition and any suspicions that may have arisen were allayed by that knowledge.

Keeper Fred Martini found the pup when he entered the rock shelter at the Sea Lion Pool on the morning of June 16, 1944. There was a great deal of excitement, of course, followed by calmer consideration. This was not the first Sea Lion to be born in the Zoological Park and at least one had been safely reared. But that was back in 1935 and the method followed on that occasion could not be duplicated. The outlook for captive baby Sea Lions in general is on the dark side and we knew that many problems must be solved.

There was no trouble about a name — it was Benny from the first. No matter that very soon we discovered there was a slight error of gender

and we would have to change the official title to Benita. Somehow, Benny seems to suit a Sea Lion — and Benny she remained. She was a perfect little replica of her mother, with sharp, bright eyes and soft, light brown coat that turned slick and black when wet. But for the first few weeks, a baby Sea Lion is as helpless in the water as a new-born puppy and if the mother is not keenly alert to her duties, a tragedy may easily occur. So our first act was to block the exit from the shelter to the pool to prevent the infant Benny from stumbling into difficulties.

For two days, Wendy kept to the den, absorbed in maternity. By the third morning, however, she had had enough. Seizing Benny by the scruff of the neck, she climbed over the twelve-inch barrier and plunged into the pool, pup and all. Reaching one of the central rock islands, she tossed her well-washed offspring to its sun-warmed surface and leaped up to join her.



This introduction was a field-day for the pool's inhabitants. One by one they came up to inspect the newcomer, Wendy standing closely on guard. None was allowed to approach too near and at the first hint of familiarity, white teeth flashed in warning. Only the father, who showed keen in-

WENDY DRAGS BENNY BACK FROM THE WATER'S TEMPTING, DANGEROUS EDGE.

terest from the first, was allowed to remain on Benny's island.

For the first few days, Benny was content with daily dunkings, as her mother carried her between rock and sleeping den, where the cool nights were spent. But soon Wendy began to find that other matters sometimes required her attention and it was when little Benny was first left alone that she found she could do a bit of creeping on her own. This, of course, soon ended with a splash, followed by a shout of dismay from a ring of spectators. But there was nothing

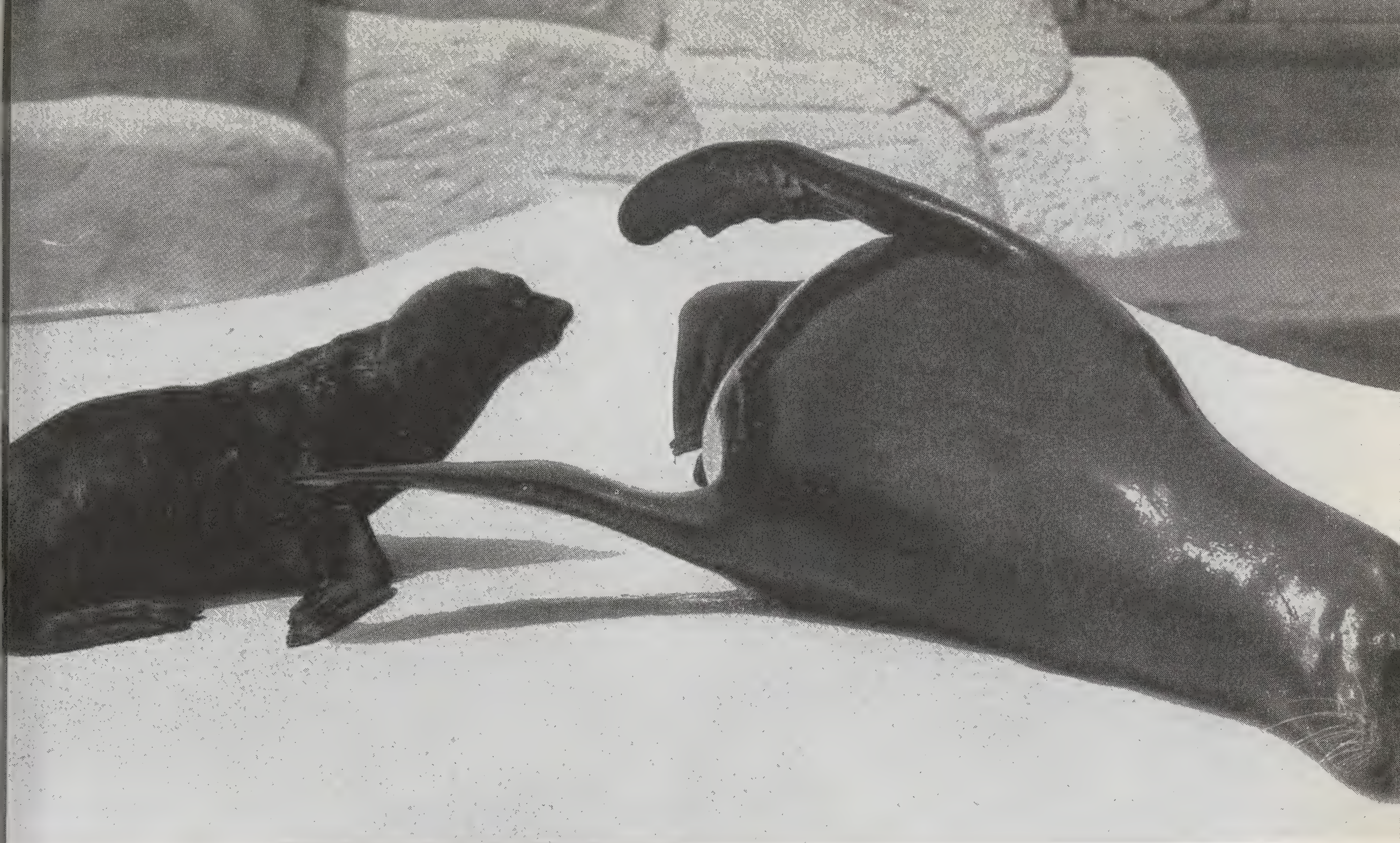
FATHER PAYS ONE OF HIS RARE AND FLEETING VISITS TO INSPECT WENDY.

to fear, for before the shout died down, two dark streaks appeared in the water below the floundering Benny. The father was first, anxious but futile. The second streak was Wendy, who caught the infant by the nape and tossed her head-over-heels to the safety of the rock and hardly lost a stroke.

This was only the first of days of excitement, for Benny simply could not manage to keep out of the water. All day long, tiny splashes could be heard, followed by a chorus of alarm that quickly turned to laughter as prompt rescue was effected. It was not until Benny was about six weeks old that she began to devote herself to overcoming this serious handicap to life in the water. She had to learn to swim.

TYPICAL GESTURE IS WENDY'S "KISS" AS SHE GIVES A REASSURING TOUCH.

A narrow flight of concrete steps runs from the outer rim of the pool into the depths. It is meant, really, for the convenience of keepers



MEAL TIME was all the time, as far as Benny was concerned, and generally as soon as Wendy came back from a swimming trip and lay down to rest, Benny approached in haste with mind intent on food.

when the pool has its weekly scrubbing. But Sea Lions too lazy to leap from the water in approved fashion sometimes lumber clumsily up it. It was here that Benny began her studies. She would launch herself from the first step, splash happily in the tiny shallow over the second, then tear frantically back before she could sink. Gradually she risked two steps and finally three, even though she sometimes had to fumble her way up

the steps. Often she would stand at the top, facing the pool and feinting the plunge but always, at the last moment, she went down the steps instead.

No one saw Benny make the final plunge but on the day when she was exactly two months old, we were amazed to see a tiny form emerge from the dark water in a perfect porpoise turn, then quickly disappear. For good, we thought—but a

MORE THAN A YEAR OLD

was Benny when this picture was taken, during her exile to the Penguin Pool, and she was still nursing and refusing to consider solid food.





SEVENTEEN MONTHS OLD and quite a sizeable Sea Lion, Benny decided—without prompting or any special fuss—that the time had come to go on a fish diet. But she preferred to take it from her keeper.

few seconds later a dripping Benny leaped from the surface, caught the edge of the rock, clung and scrambled to safety.

That should be the end of the story, really, with Benny tearing triumphantly about the pool, no longer dreading splashes. But there is more, much more. For Benny still had to learn to eat solid food instead of nursing, and compared with that task, learning to swim was as nothing.

The best information available to us was to the effect that a young Sea Lion should begin to take fish when about four months old. It was perfectly obvious that she had not the slightest chance of doing so in the intense competition of the pool. So in October Benny and Wendy were removed to the southern end of the Penguin Pool, where they could be controlled and protected. We found, almost at once, that Benny would take minnows freely if they were offered

her while in the confines of a shifting cage and that she digested them with no difficulty whatever. We also found that when she was at liberty, she was pleased to play with the minnows but that nothing would induce her to swallow them. She seemed content to receive her nourishment from Wendy.

All through the winter, past Benny's birthday in June and far into the autumn, there was no real change. She still would have no fish. In September, 1945, we decided to paint the interior of the Sea Lion Pool, to improve under-water visibility. So the remainder of the inhabitants were taken to the Penguin's quarters, where Benny had opportunity to renew old acquaintances. Early in November, when the Sea Lion Pool was ready for occupancy, we decided that Benny and Wendy should go along, too, fish or no fish. We had given up trying.

Benny liked the big pool. Pale blue paint combined with minute suspensions of solids in the water to produce an entirely unexpected clear sea green and as Benny dashed about its broad confines, her grace and daring were plainly visible. She was definitely the life of the party, pursuing first one, then another, of her adult companions in a frenzy of play that quickly exhausted the older animals. But in calmer moments, Benny could be seen basking on a sunny rock in company with her mother, receiving the nourishment on which, it seemed, she would always live.

Then, on November 22, when Benny was just over seventeen months old, came the great day. She ate a smelt. No preliminaries, no special effort — she just ate it. After that, she ate freely, just as though she always had done so. And within a few days of that first smelt, she gave up nursing for good.

Feeding Benny is still something of a ceremony. In the Penguin Pool with Wendy, Benny had made a great business of playing with tossed fish, even though she had no mind to eat them. She tried this, at first, in the big pool but quickly learned better. A Sea Lion is an insatiable animal, as far as food is concerned. Ten pounds of fish daily will keep it in health but it will take twenty if it can get them. That is what makes watching the feeding of Sea Lions such good sport — devil take the hindmost but also squash the first! Benny must have had a bitter, unseen experience, for a fish dropped in her direction still causes her to depart with great speed, often none too soon. So Benny has her food quietly, at one side, while skilfully thrown tidbits keep competitors at a distance. Some day, when her fifty pounds have multiplied, she may compete on equal terms with her four hundred-pound father.

Footnote to Darwin

By MYRON GORDON

WALKING HIS ROUNDS behind the tanks of the old Aquarium in Battery Park, a keeper spotted a dying Spiny Boxfish. He dipped it out and carried it into the office of the Aquarium's pathologist.

The sequel of his routine action is, possibly, a footnote to an observation that puzzled Charles Darwin more than a hundred years ago.

Darwin had written, of a certain diodont fish in his possession:

"The most curious circumstance is that it secretes from the skin of its belly, when handled, a most beautiful carmine-red fibrous matter, which stains ivory and paper in so permanent a manner that the tint is retained with all its brightness to the present day. . . . I am

quite ignorant of the nature and use of this secretion."

I happened to be a visitor in Dr. Ross F. Nigrelli's office the day the dying boxfish was deposited on his desk, and I noticed that the belly of the fish was vivid with a curious carmine-red slime. Too, I happened to remember Darwin's comments on the red stain from a similar or related diodont, and mentioned the reference to Dr. Nigrelli. He would have made a study of the red slime on the Aquarium's fish, routinely, anyway, but in the light of the Darwin observation he went into action immediately. With a scalpel he scraped off some of the reddish substance, smeared it over a glass slide, and placed it under a compound microscope.

Could these two cases, discovered about a century apart, be related? I waited for the pathologist's report.

"The boxfish is suffering from a severe infestation of *Oodinium* protozoan parasites," he said to me. "You remember I wrote my doctorate thesis on this organism. It was published in *Zoologica*."

This is the *Oodinium* story:

It is a single-celled organism, so small that 1,000 of them would fit comfortably on the length of its name. It may be small, but it leads a dual life, a sort of protozoan Dr. Jekyll and Mr. Hyde. As the benevolent Dr. Jekyll, the microscopic droplet of life spends its time as an independent, free-living organism, utilizing the dissolved food and chemicals in the sea with the aid of the light energy of the sun. It can do this by virtue of being the possessor of those mysterious vital chlorophyll bodies generally associated with green plants. In this state it may be regarded as a plant and as harmless as a daisy.

After a period spent swimming about under its own power, the *Oodinium* enters the darker side of its dual personality, the malignant Mr. Hyde state. It often is sucked into a boxfish's mouth with the water, and as it passes over the fish's gills it clings to the gill filaments. It settles down for a life of ease. Now the newcomer finds that

it no longer has to manufacture its own food and travel about aimlessly, for its food is readily available on the body of its host. The tiny parasite prospers, and produces innumerable young, all of which remain with their paterfamilias to feast at the expense of their host.

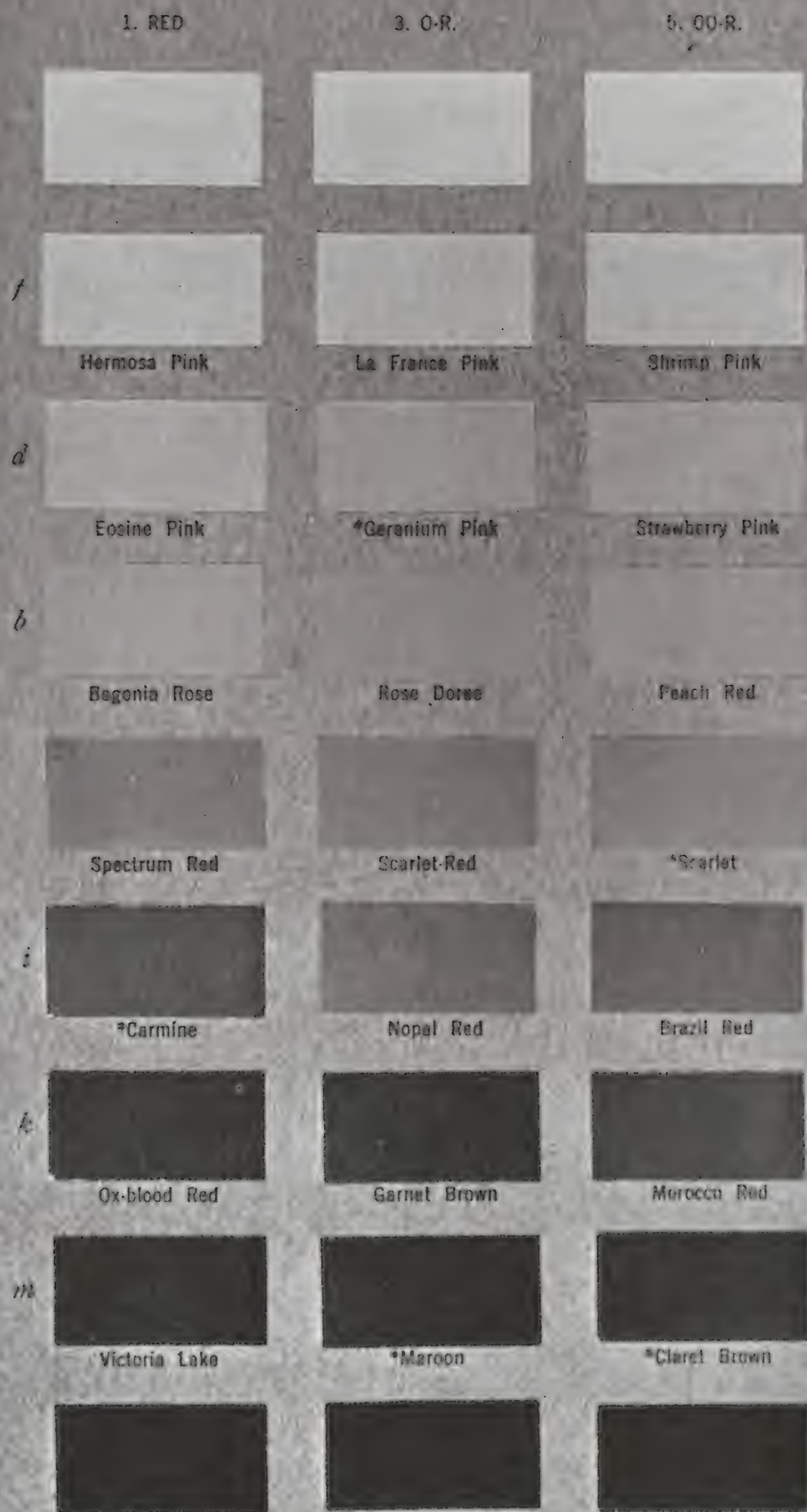
Under ordinary conditions of life, each *Oodinium* has an incredibly small red pigment rod in its make-up, but under special conditions the entire cell becomes red. The red state may develop when the microscopic globs of life swarm in uncountable numbers in the sea. On occasion they may discolor the water and bring about that remarkable phenomenon known as "red water." *Oodinium* is only one of many *Dinoflagellates*, (so called because each cell has two whips for self-propulsion), which turn themselves and their environment red periodically. "Red water" has been seen off Sandy Hook and Narragansett Bay by scientific observers, who attributed it to a swarm of *Peridinium*. And the famous "red snows" in Alaska and other arctic regions have been explained by the presence of untold millions of other types of microscopic organisms.

I called Dr. Nigrelli's attention to Darwin's experience in permanently staining a piece of ivory with the red slime from the belly of a diodont, and suggested that he perform a similar experiment. Dr. Nigrelli took a clean sheet of



Courtesy Shedd Aquarium

A DYING SPINY BOXFISH (CHILOMYCTERUS SCHOEPFII) GAVE A CLUE TO DARWIN'S PUZZLE



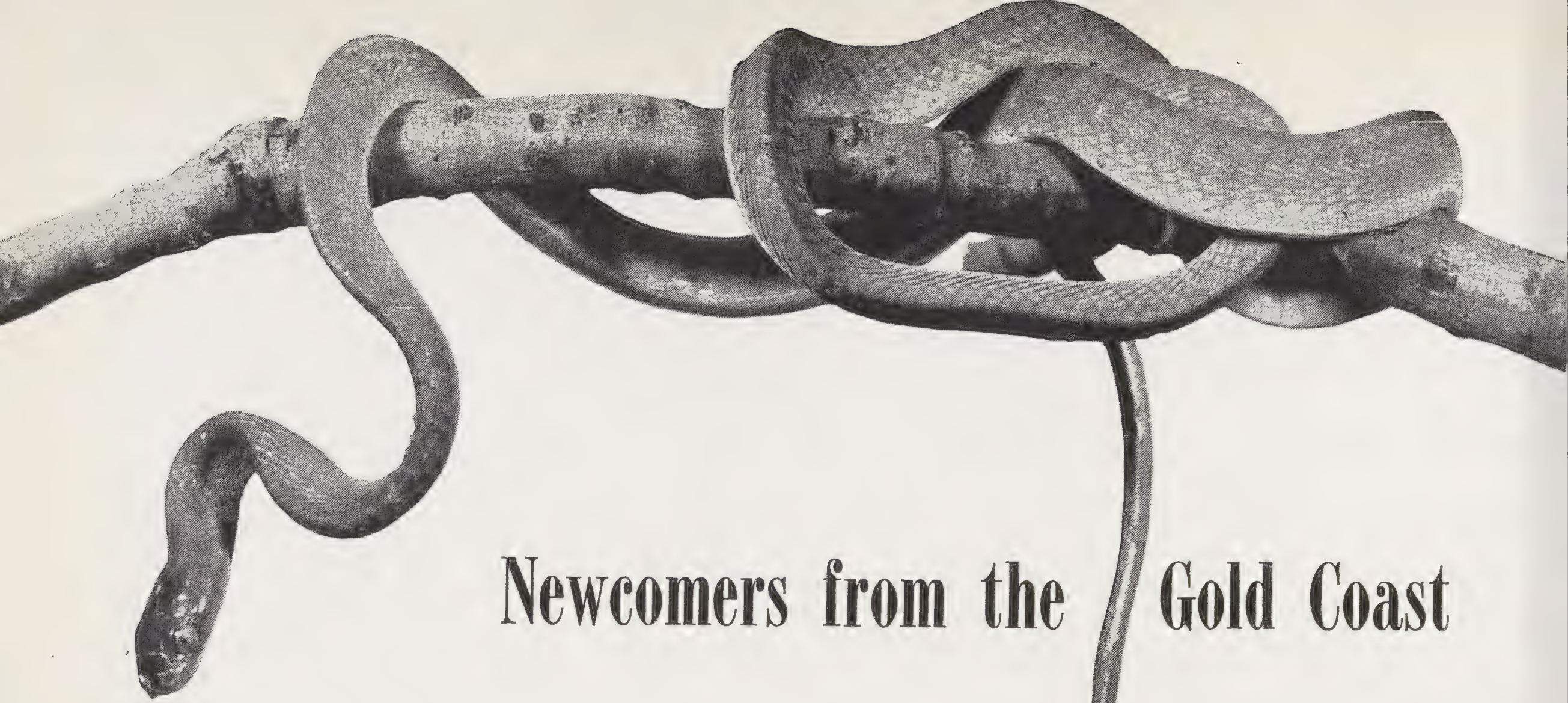
Handwritten notes:
 Oodinium - from ...
 (1907) ...
 Nov 21, 1919

SIDE BY SIDE are (left) Plate I from Ridgway's "Color Standards and Color Nomenclature," and (right) sheet of blotting paper stained seven years ago with *Oodinium*. The stains match "Carmine."

white blotting paper and applied it several times to the red slime from the soft underbelly of the sick boxfish. Every once in a while I have asked the doctor to let me see that blotter. I have been doing so for the past seven years, and it seems to me, and to Dr. Nigrelli, that the paper is just as red today as it was on the day it was stained.

The idea occurred to both of us that the poison, teraodontoxin, attributed to many kinds of puff-

ers may in reality be due, in the final analysis, to some of the *Dinoflagellates*. The protozoans may be eaten by small plankton feeders like marine worms, snails, shrimps and other invertebrates, and these in turn may be eaten by the puffers, the potentially toxic substance being passed along the complicated food cycle, harmless to animals of the sea but poisonous to pigs, dogs, cats and man.



Newcomers from the Gold Coast

First shipments are coming in, and among them some interesting species we have never before had on exhibition in the Zoo.

By BRAYTON EDDY

NOW THAT THE WORLD CONFLICT is over, the key log preventing shipment of reptiles from the Gold Coast and other parts of Africa has been removed. Native boys have taken their crude but effective gear into the bush and the rain forest to trap desirable specimens for animal-starved zoos throughout the world. The New York Zoological Society was especially fortunate in mid-winter to obtain two consignments of reptiles from Africa as forerunners of things to come.

The Cape Cobras make an especially appealing display as they rear back and spread their hoods at the least provocation. We now have four species of cobras, all deadly poisonous, the Cape Cobra being the smallest (4 feet long) but also the most alert. It has a characteristic small head and slim body. Two color phases are represented; the all-yellow phase and the yellow phase speckled with attractive amber and black. Although these reptiles will climb trees after young birds, their chief diet consists of ground rodents and other snakes. They are the cause of many deaths among barefooted African natives.

A snake quite as poisonous, but with a thick body and large flat head, is the Puff Adder. This

UP A TREE, as usual, is the whip-like Blotchy Tree Snake.

snake is a viper and not to be confused with our native Hog-nosed Snake, often called a Puff Adder—which is harmless. The African Puff Adder has long fangs that work on a hinge, when the mouth opens and shuts, after the manner of rattlesnakes. It does not puff up, as its name would imply; but when excited it will breathe hard and create a hissing sound that is a warning demonstration rather than a prelude to attack. The Puff Adders are about three feet six inches long and their chubby brown bodies are decorated with black and yellow chevrons. They act as benefactors by ridding native huts of rats and mice; and because they are not aggressive their presence is often tolerated. Among their enemies are the Buzzard, Eagle, Secretary Bird, Ground Hornbill, Mongoose and Warthog.

Two African constrictors known as Mole

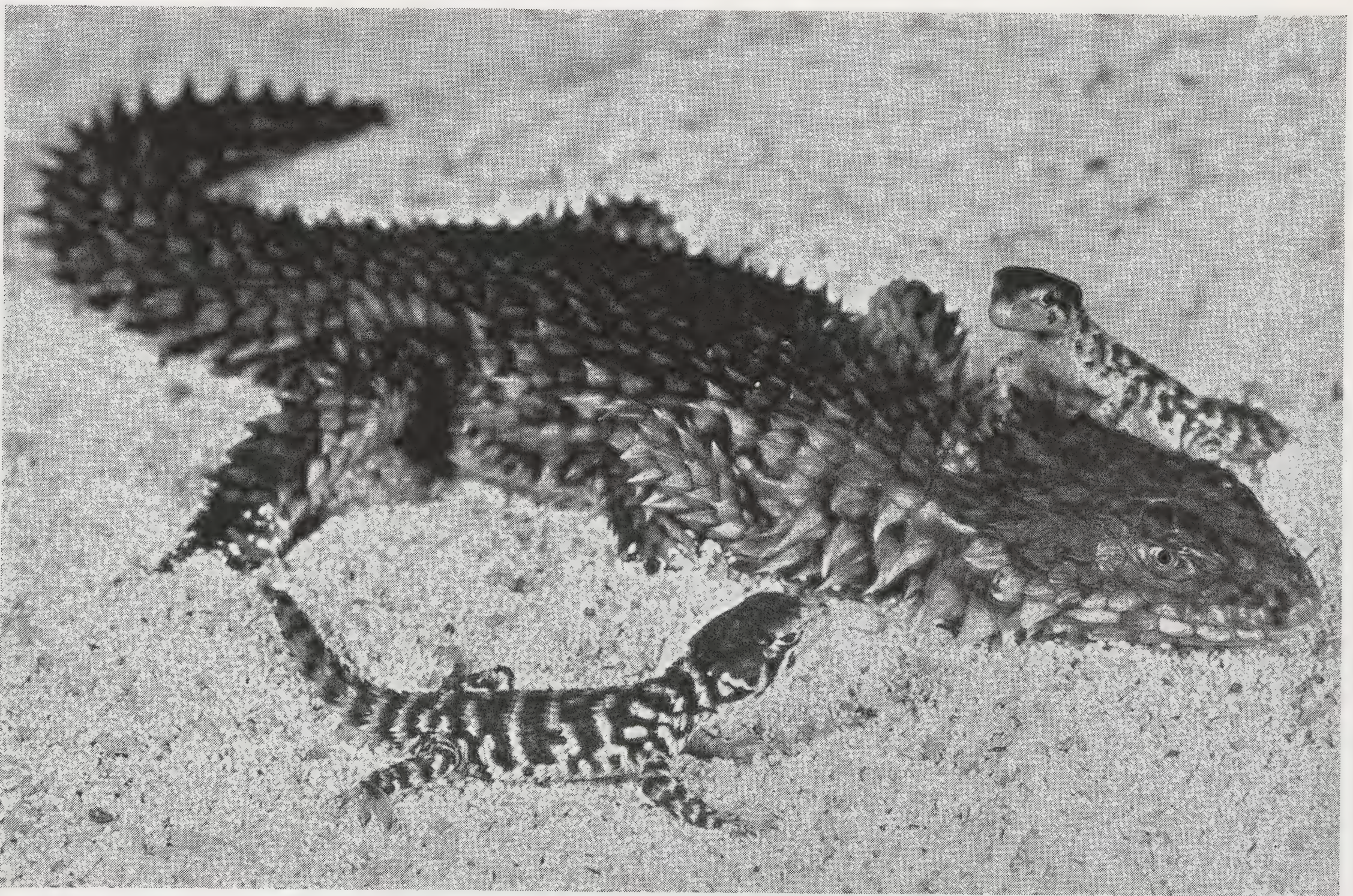
Snakes came with the January shipments. They are not poisonous, but sometimes will attack with heads raised after the manner of cobras. Although drab greenish-black in color, the high gloss of their scales and the well-rounded four-and-a-half feet of body give them an impressive appearance. Their name comes from the fact that they eat moles, but also they devour destructive rodents. They are exceedingly prolific, as many as 80 young being born alive in one litter. African Puff Adders likewise are born alive, but cobras lay eggs.

Two species of rear-fang snakes, mildly poisonous, arrived from tropical Africa. The Blotchy Tree Snake has a pinkish-brown body, strikingly compressed, and climbs trees after small birds and mice. Kirtland's Twig Snake is even more arboreal. With its dark green head plates, pointed snout, obscurely mottled scales and very long slender tail, it will pose on a branch for hours on end, without moving, much to the awe of native tribesmen. But let a small lizard venture near and the sphinx will dart into action. The venom

of these rear-fang snakes is comparatively weak, not available in quantity, and the rear fangs cannot easily inflict wounds in large animals.

An addition which is doing considerable toward putting life in the gila monster case is a group of eight Zonure Spiny Lizards from the bare, open areas of Africa. They are perky specimens, their noses raised in the air for long periods of time like hounds barking at the moon; and they display considerable activity, in marked contrast to the sluggish immobile specimens from Gila River. Their thorny tails and headdress suggest relationship to our western horned lizards, but their bodies are thrice as long. Both species, however, are insect-eating yet will take tiny balls of raw lean beef if rolled in their direction.

This is the first time that a Blotchy Tree Snake has been exhibited at the Zoological Park, and it has been several years since Cape Cobras, Puff Adders, Zonure Spiny Lizards, Kirtland's Twig Snakes and Mole Snakes have been displayed.



TWO BABIES (their spines soft and short, their markings strong red, black and cream) were born to a Zonure Spiny Lizard a few weeks after her arrival at the Zoological Park. The babies were active and alert and we had hopes of rearing them, but refused to eat and died within forty-eight hours after birth.



1 AT THREE DAYS, JUNIOR HAD GOLDEN HAIR ON HEAD AND SHOULDERS; HIS BODY WAS BARE.

The Carefree Life of a BABY GIBBON

By LEE S. CRANDALL

5 AT THREE MONTHS, JUNIOR LOOKS LIKE A REAL GIBBON — EVEN TO THE JUVENILE WHISKERS!



2 A SYLVAN IDYLL — THE MOTHER AND BABY ON A TREE-TOP PERCH ON OUR GIBBON ISLAND

IN THE PAST nearly fifty years a great many animals have been born in our Zoological Park. Great or small, rare or common, all, in their day, have enthralled our throngs of visitors. The appeal of infancy is universal.

Perhaps, then, it is not so remarkable that, from the day he came indoors with his parents, Junior Gibbon should have been such an instantaneous success. He has an advantage, of course, in being a member of the monkey tribe. Zoos, so far, have had little success in trying to convince visitors that other animals are more attractive than monkeys. But even though most people

6 STILL A BABY, AFTER ALL, JUNIOR USES MOTHER'S FINGER AS A SOFT TEETHING R





AT NINETEEN DAYS, JUNIOR WAS BEGINNING TO BE WELL CLOTHED IN YELLOWISH HAIR.

make little distinction between the general run of monkeys and the more highly organized anthropoids, Junior has something of his own that sets him apart.

At first he was so tiny, so helpless, his great, staring eyes so devoid of expression, that no one would pass him by. Later, as he began to move about, with his ludicrous little body, spiderlike legs and the noticeable absence of a tail, he was irresistible.

Junior's first excursions on his own were noted when he was six weeks old. They were of a very minor nature, of course, with his mother's

FOUR MONTHS OLD — AND BEGINNING TO EXPLORE THE FASCINATING WORLD AROUND HIM.



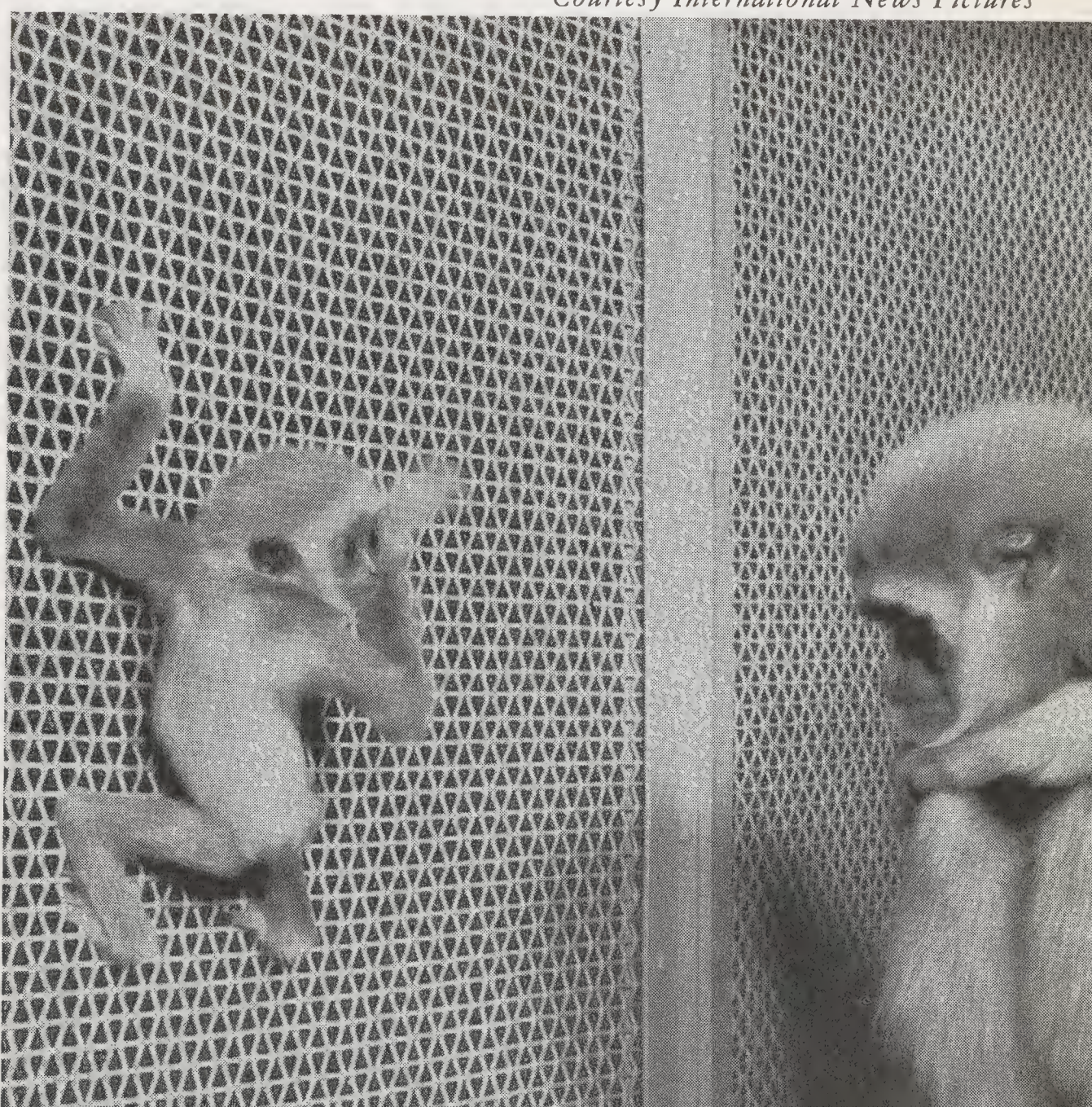
4 STILL CLOSELY PROTECTIVE, THE MOTHER CUD- DLES HER 24-DAY-OLD BUT HELPLESS INFANT.

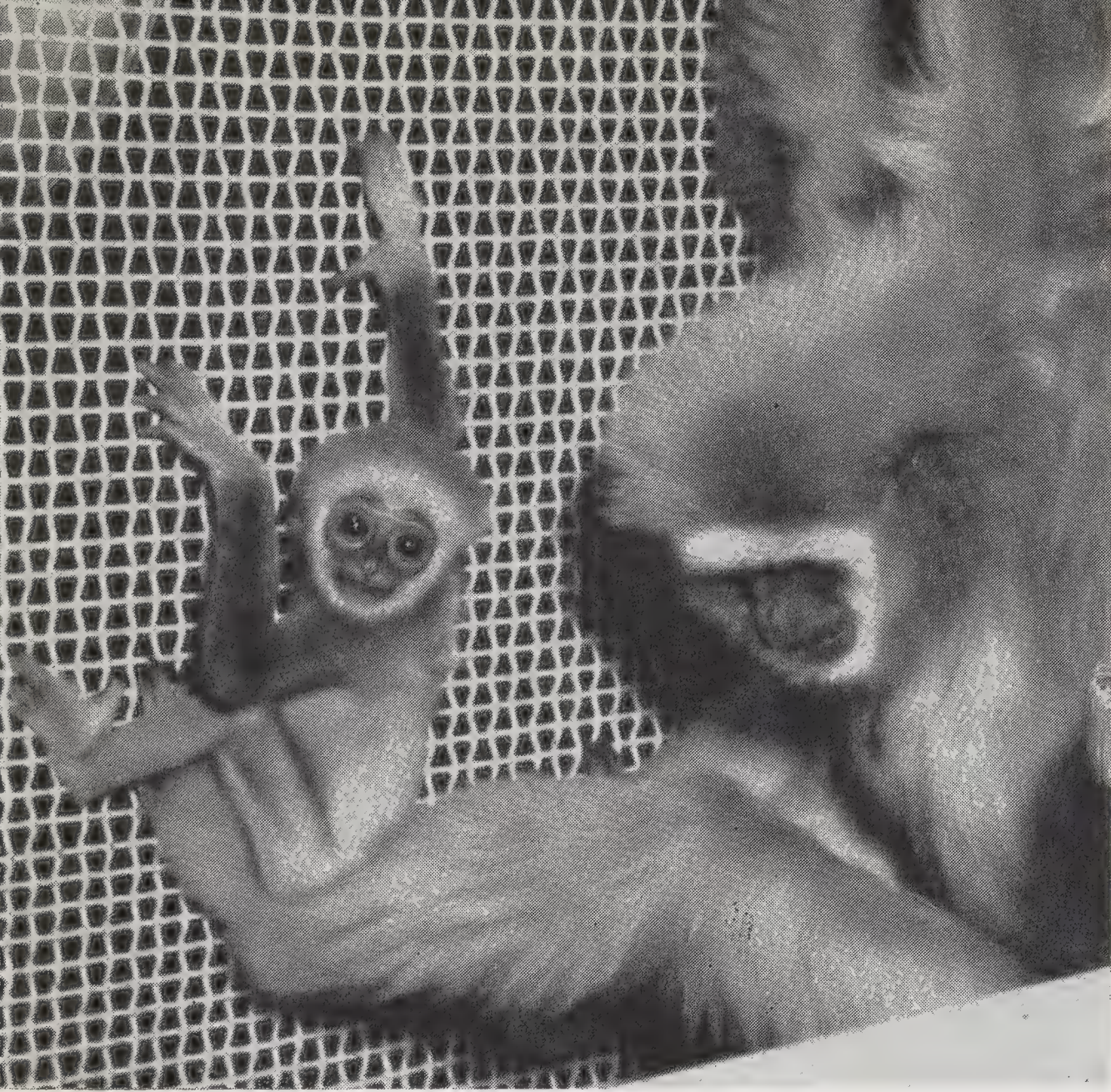
hand always ready to snatch him back from fancied danger. Little by little, as he grew stronger and bolder, he wandered to the wire netting where he clung with determination. By this time the mother was encouraging Junior in his investigations and was even seen to help him detach himself from her body. As soon as he was safely detached, she would set out on a breath-taking round of familiar hand-holds as though glad to be relieved of the clutching arms that had encircled her body so tightly for so many weeks.

At such times, Junior would beg her, in a

8 HE MADE SMALL EXCURSIONS ON HIS OWN, BUT BECAME FRIGHTENED IF HE WAS LEFT ALONE.

Courtesy International News Pictures





Courtesy International News Pictures

9 THIS IS WHAT HE REALLY WANTED — THE COMFORTING FEEL OF HIS MOTHER CLOSE AT HAND.

thin, piping voice, not to abandon him. Always, when she returned, he would crawl at once to her arms—and then invariably return to the wire. He wanted her to stay close at hand while he explored this strange new world.

Junior was four months old when he was first seen to take solid food—if bread crumbs are solid! Even when he was a little shaver, his hands were always searching. Often enough, the slender fingers closed on some small object which, baby-like, was quickly on the way to his mouth. But it never reached its intended destination, for always the mother, seemingly in-



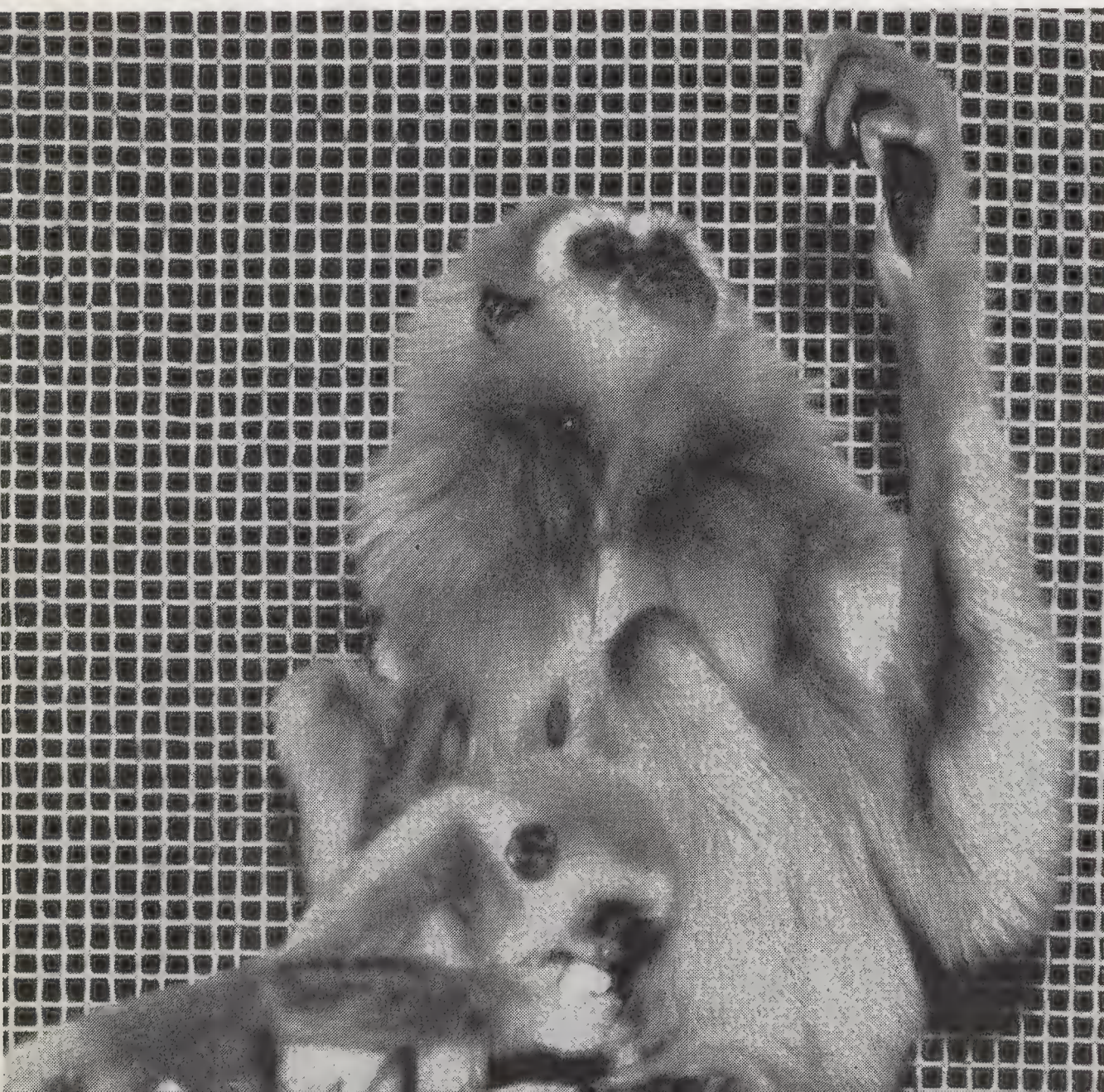
10 NIBBLING SOLID FOOD WAS PERMITTED WHEN JUNIOR WAS JUST ABOUT FOUR MONTHS OLD.

different, interposed a casual restraining hand.

Junior's progress from bread crumbs to bananas was slow and presumably tiresome, but certainly safe. Even now, at more than seven months, he is allowed hardly more than a snack.

His food supply must be sufficient for his needs, for his constant activity is amazing. He runs over the wire netting like a fly without wings; he traverses the metal cross-rods hand-over-hand with skill and confidence. Sometimes, of course, confidence exceeds ability, but a deeply-bedded floor safely cushions his occasional slips.

11 SLY JUNIOR SNEAKS A QUICK SNACK WHILE HIS MOTHER'S ATTENTION IS DIVERTED ELSEWHERE.



12 AND NOW HE'S VIRTUALLY A BIG GIBBON, HE HELPS HIMSELF TO SOLID FOOD CONSTANTLY.





HIDEAWAY LABORATORY in the basement of the Zoo's Lion House was the testing place for the 200 Electric Eels that went to war. Aquarium Curator Christopher Coates is "mapping" an eel's current.

The Electric Eel *Went to War*

By WILLIAM BRIDGES

YOU PROBABLY NEVER HEARD of diisopropyl fluorophosphate — DFP for short. It is a war gas, quick and deadly; a whiff, no heavier than the springtime scent of an apple orchard, and the pupils of one's eyes may contract to pin-points. A lightly gassed army might wander in blind-

ness; increase the dose and every living thing that inhaled the gas would crumple in almost instantaneous death.

It sounds fantastic, it *is* fantastic. But hardly more fantastic than the fact that in the last two years of the war, some two hundred Electric Eels lived for a time, then died, in the basement of the Bronx Zoo's Lion House to speed research in diisopropyl fluorophosphate.

Curator Christopher W. Coates of the New York Aquarium arranged for the collecting of Electric Eels in the headwaters of the Amazon, for their rapid transport by air to New York, for their storage in a battery of 22 great wooden

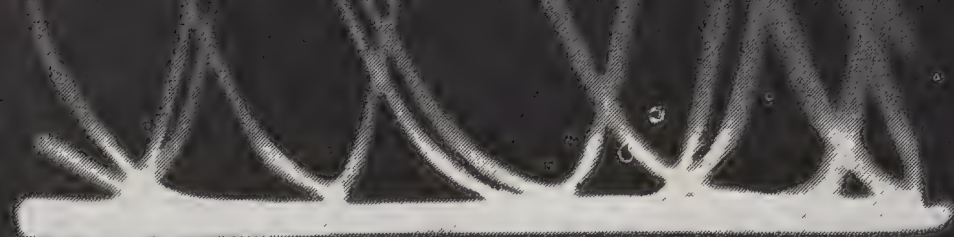
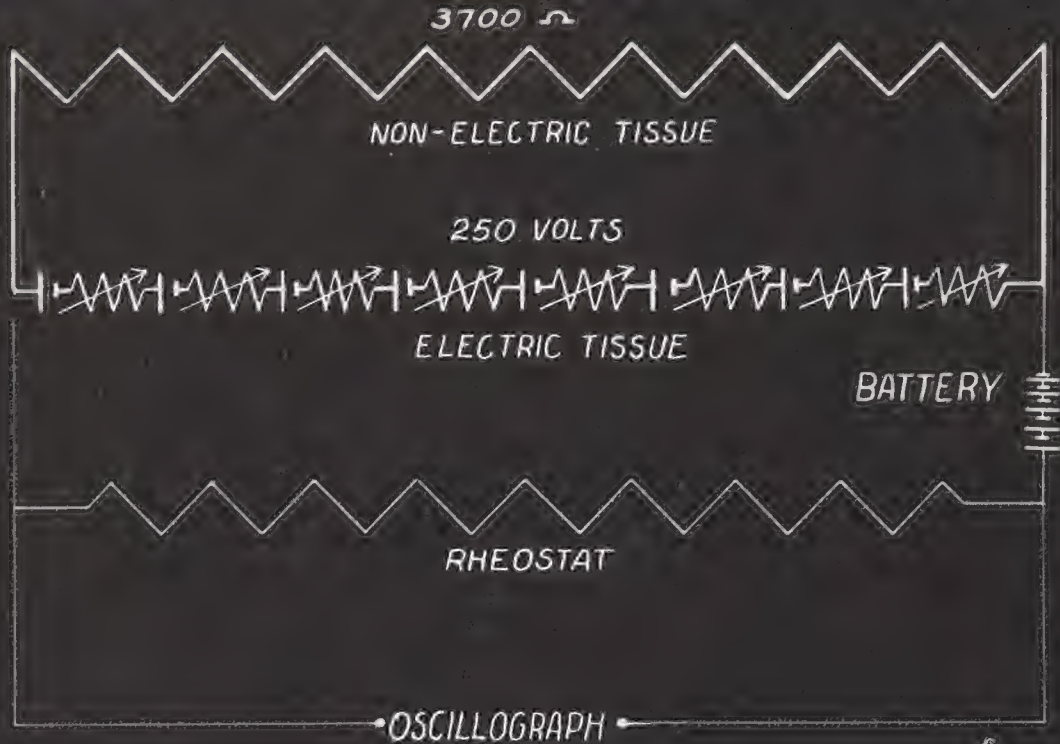


FIG. 1.

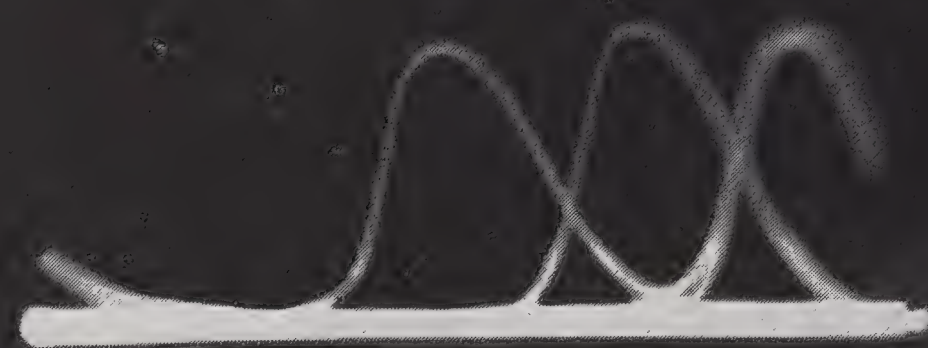


FIG. 2.

HOW WE STUDY THE ELECTRIC EEL

TO THE PHYSICIST, the Electric Eel is simply a machine that produces electricity—a living machine, it is true, but nevertheless a mechanism that obeys known electrical laws. Consequently it is possible to construct a theoretical "wiring diagram" of an Eel. (Upper left).

Some of the Eel's electricity is dissipated in skin, bones and swimming muscle. In this particular diagram, allowance is made for 3,700 ohms of leakage resistance. Electricity is produced in the electric tissue and in this diagram a 250-volt segment of the Eel has been selected for measurement. A longer section might produce up to 550 volts.

In mapping an Eel's electric organs, batteries of known voltage and a rheostat of known resistance are electrically balanced across the current flowing from the Eel into a cathode ray oscillograph. When the Eel discharges, the current produces tracings of light on the fluorescent screen of the oscillograph, and the batteries and the rheostat are manipulated in such a way that the tracings on the screen can be appraised in exact terms of voltage and speed of discharge. The tracings can be photographed for further study.

tanks in the basement of the Lion House. He kept them alive and vigorous, mapped their electrical characteristics and then dispatched them with a stroke of the scalpel when the time came for them to contribute their electric tissue to the war effort. Yet it was only in the last few months that Coates gained more than the vaguest suspicion of the intricate chemico-physical processes that were set in motion when his eels gave up their lives.

Now it can be told — in part.

The New York Aquarium's link in the chain that leads to diisopropyl fluorophosphate was forged fifteen years ago when (rather casually at first) Curator Coates became curious about the electrical properties of the Electric Eel from the freshwater streams of South America. Benjamin Franklin, Faraday, Cavendish and a host of scientists of an earlier day had been curious, too, but they lacked the exact instruments for measurements of such an astonishing organism as an

electric fish. About all they could do was to make shrewd guesses.

Then the new science of electronics came to the fore, and around the Aquarium's eel tanks gathered a succession of keen young biophysicists and bio-chemists from the great universities and research laboratories. They brought elaborate instruments from their home laboratories, exhausted their possibilities and invented new ones. One or two commercial laboratories, intent on pushing back the boundaries of electronic knowledge, contributed apparatus and skills.

It was a quiet, non-spectacular, kind of research; every now and then a technical paper appeared in *ZOOLOGICA*, the Zoological Society's quarterly journal, thorny with mathematical symbols and illustrated with stark graphs and tracings from oscillographic screens. The papers meant little to the general reader, but specialists were getting interested — physicists, bio-chemists

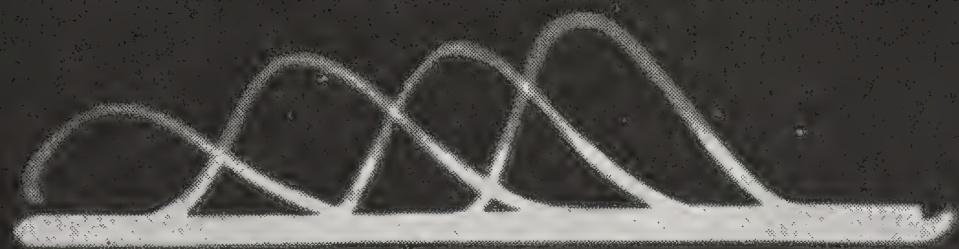


FIG. 3.

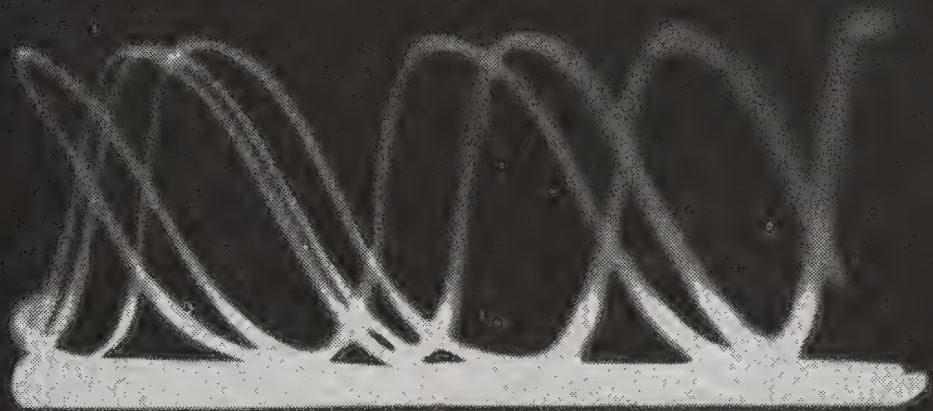


FIG. 4.

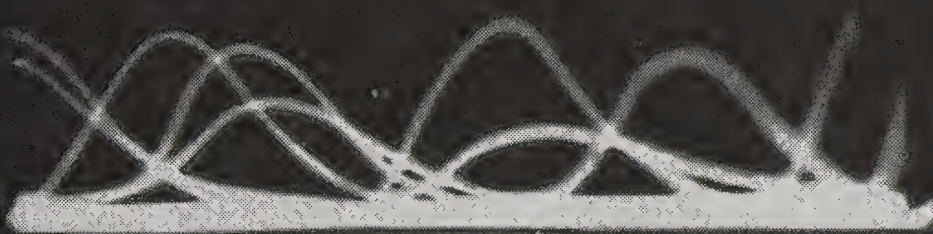
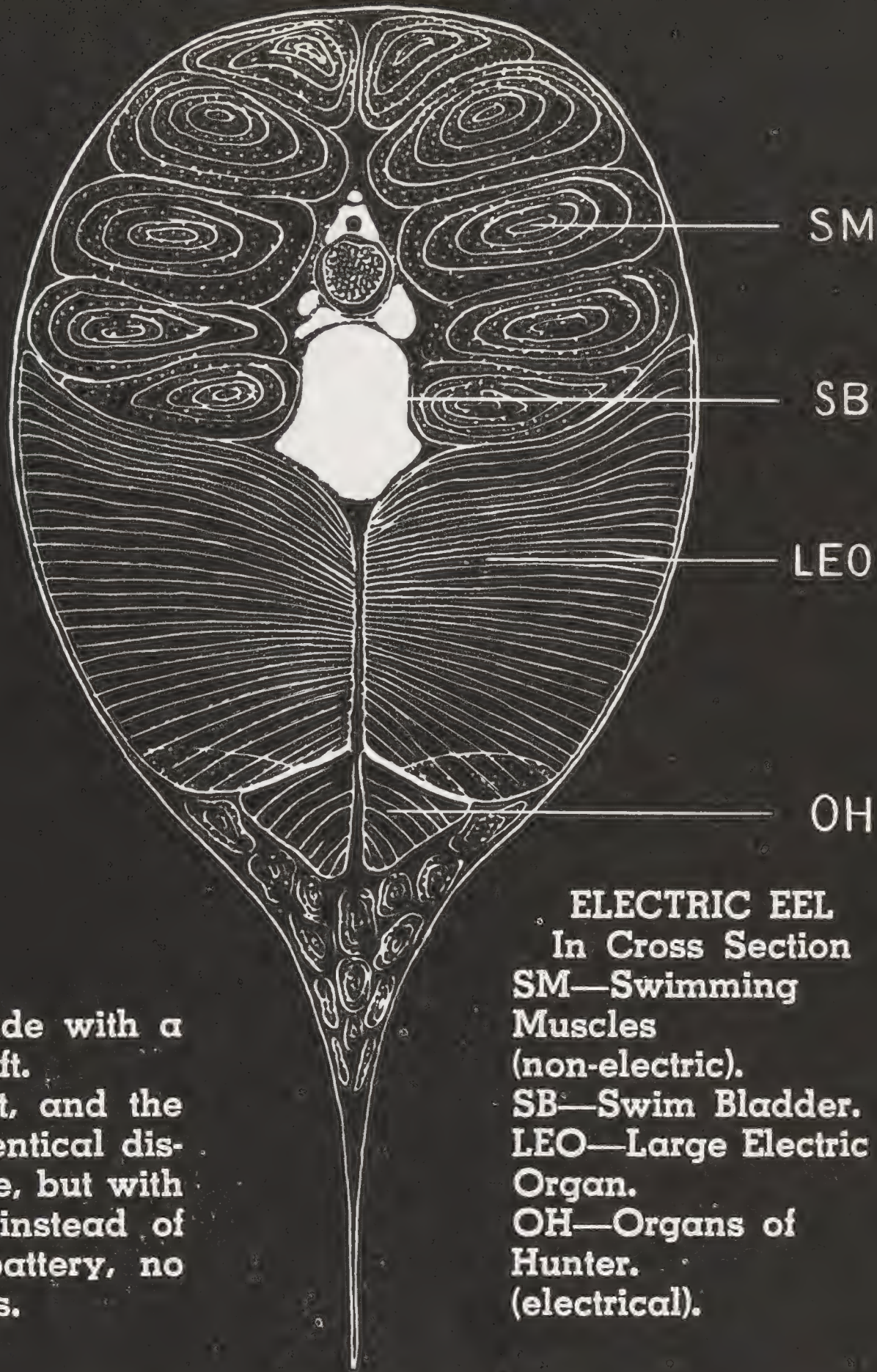


FIG. 5.

FIGS. 1-5. Typical oscillograph tracings, made with a "hookup" similar to the wiring diagram at the left.

FIG. 1. With a 90-volt battery in the circuit, and the rheostat set at 1000 ohms resistance. FIG. 2. Identical discharge, but without the battery. FIG. 3. The same, but with a 90-volt battery opposing the Eel's discharge instead of reinforcing it. FIG. 4. Normal discharge—no battery, no rheostat. FIG. 5. No battery; rheostat at 300 ohms.



**ELECTRIC EEL
In Cross Section**
SM—Swimming
Muscles
(non-electric).
SB—Swim Bladder.
LEO—Large Electric
Organ.
OH—Organs of
Hunter.
(electrical).

and physiologists; they joined the team as full-time investigators, or part-time as special problems arose.

Then the war came along, and Electric Eel research seemed to fade away. For a long time there were no papers in *ZOOLOGICA*, no idle gossip of current eel problems in meetings of the Zoological Society's staff. The eel experiments seemed to have been laid aside until after the war.

But behind the scenes, the eel research was proceeding at a pace—and in a direction—hitherto undreamed of.

In 1939 Yale University had asked the Aquarium to make its eels available to Dr. David Nachmansohn, one of their investigators of nerve activity, who was interested in electric fish. A number of investigations were carried out by him and his associates, first at Yale University and eventually at Columbia University with the facilities of the College of Physicians and Surgeons

and the backing of Dr. T. J. Putnam, the Director of the Neurological Institute. The work of these investigators has greatly contributed to the understanding of the mechanism of nerve activity.

When the Chemical Warfare Service developed its deadly gas, diisopropyl fluorophosphate, that acts by destroying nerve activity, this group was in a position to make important contributions.

In substance, the problem is this:

When you think, your thought speeds through your body, over a network of nerves, at the rate of about 65 feet a second. And all along that network of nerves, electric potential is being built up, discharged, and then restored. In this process, a nerve chemical called choline esterase plays an essential role.

Choline esterase can be extracted from almost any nerve tissue. It is a catalyst which splits an-

Continued on Page 88

An M. D. Looks at Conservation —and the Zoological Society

By ALAN GREGG

*Director of Medical Sciences
of the Rockefeller Foundation*

IN TAKING an active part in conservation of the natural environment of man, the New York Zoological Society pursues a wise course. It is a wise policy for a number of reasons, some immediate, others remote but nonetheless powerful, some threatening, some attractive, some obvious and a few rather elusive.

Now that guns and ammunition will be again easy to obtain, our populations of wild ducks and game of all kinds will again suffer from the enthusiastic attention of those who hunt to kill. The rapid elimination of whales in every ocean will soon resume the quickening tempo of pre-war days. The demand for furs of all kind will increase. That most destructive of all animals, man — the only animal that gives deliberately false signals to his own kind and stages war on his fellows; the only animal who will die, and also kill, for an ideal — has now lamely returned to what we call peacetime pursuits — pursuits of the mallard, the bighorn, the redwood trees, the Christmas trees and the topsoil — to name but a few. Such a spectacle provides me an immediate reason for being glad that this Zoological Society is interested in conservation.

By so much as any society or group acquires contact with the rest of mankind, it thereby begins to have meaning. Indeed if anything has a meaning it is in terms of a relationship outside itself — a relationship in the past, the present, or a potential relationship in the future. So when this Society takes an active part in conservation work it takes on more meaning — for its members, for the public it serves, and a happy mean-

Why should a Zoological Society be so greatly concerned about conservation? Here is the philosophy of it, pungently stated.

ing indeed for the infinite continuity of creatures that form the natural environment of man.

The greatest protection hitherto of all manner of plant and animal life has been geographical inaccessibility to man, the destroyer. That bald fact is well illustrated in the autumn of peacetime by the carcass of a three-prong deer lashed on the baggage rack of a returning automobile. Does not the airplane, too, which needs no road but can land on any remote lake, reduce to tragic absurdity the isolation that has hitherto protected wild life? Isolation must be followed by conservation if our fellow creatures are to survive the machines devised by man for destruction and now for travel. Only efforts in behalf of protection can substitute for the blessed but now vanished sanctuary of inaccessibility.

I do not plead only for the wild life and the rare creatures of this earth. My argument is that we must use time and strength and imagination to preserve our own human environment of plants, insects and animals. In saving them we shall save ourselves — and only so. How paradoxical it is that dwellers in cities, who could not survive alone for one month, do not fiercely insist upon the dependence of man on animal and plant life! Any process that requires more than a day escapes their comprehension. One errant aviator, hitting the Empire State building, causes



Courtesy U.S. Forest Service

IT'S A SCENE to make the city-weary long for vacation time, isn't it? This is one of the beautiful vistas on the north fork of the White River, in the White River National Forest of Colorado, with Himes Peak in the distance. It's a region of perfect wilderness and unspoiled, untouched beauty.

NOW TURN THE PAGE



Courtesy U.S. Forest Service

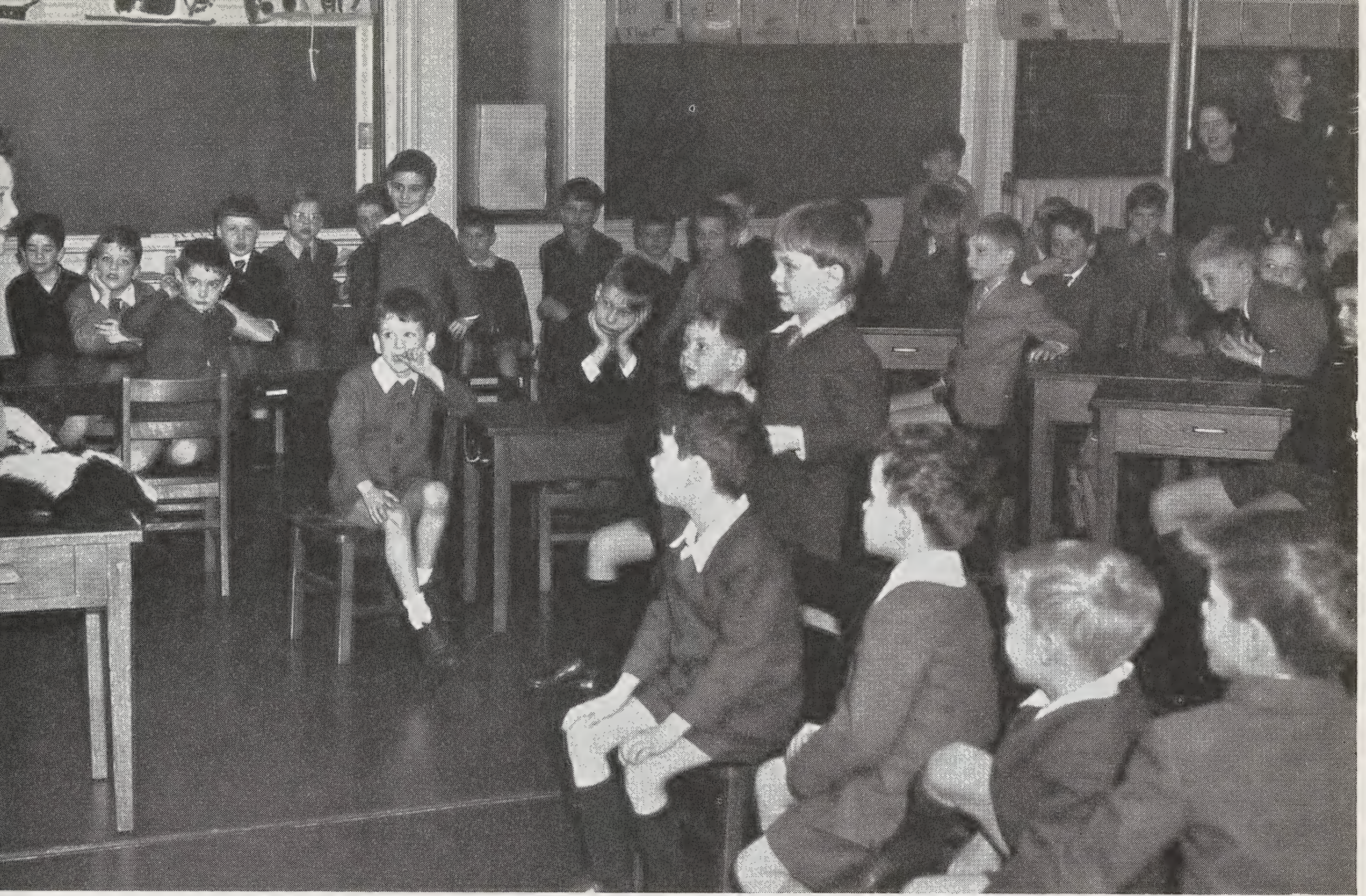
AND SEE WHAT MAN HAS DONE

THIS DOESN'T HAPPEN to be the actual scene on the previous page after loggers and fire have passed over it, but it might very well be, for similar "before and after" contrasts are all too common all over the world. This happens to be a logged-over, burnt-over tract of forest land in Pennsylvania.

more foreboding than an announcement that we have permitted soil erosion to ruin more acreage of useful farm land in the United States than is represented by the whole state of Georgia. Two hundred million acres out of our entire 1,940 million acres have been found upon survey to be seriously eroded, leached or depleted by over-cropping without proper replenishment or care. Now, when the soil fails, everything fails—including human nutrition and resistance to disease. Carl Sauer pointed out to me once that the greatest money-making crops of early American agriculture, tobacco, corn and cotton, were all plants completely new to the farming traditions of European immigrants. Small wonder that with climatic extremes of heat and cold, flood and draught, which Europeans never encountered, the price has been exorbitant—the price of ruined land and silted streams. As Arthur Mason said, "A nation with muddy streams is inevitably impermanent." Does that fateful fact escape our overloaded minds? Our Great Lakes fisheries have declined to a quarter of what they were,

due largely to the inwash from what were good farms. We are using wood faster than we are growing it. These dolorous items remind me of a remark of Gilbert Chesterton: "They stoned the false prophets, it is true, but they might have stoned the true prophets with a greater and juster enjoyment."

Has man among all living things still to learn the lesson taught the Herrenvolk? Is it a reassuring mark of superiority to kill, waste and dismember any creatures not in our mold? Why do we in one vast neurosis insist on the illimitable and exclusive importance of human beings? Need anyone say that it is sound and sage and rewarding to work with Nature and not against her? The mark of sanity is a comprehension of the realities of existence. The proof of alertness and vitality is the quickness and clarity of such comprehension. I would urge upon you in this Zoological Society an interest in conservation because it is sane and alert and wise, and a beautiful part of the delightful business of finding how eminently livable life is.



YOUNG FACES TAKE ON A RAPT EXPRESSION WHEN PETUNIA, THE SKUNK, MAKES AN APPEARANCE

Petunia and Jeffrey Visit School

By DONALD T. CARLISLE

MOST RESPECTABLE SKUNKS sleep in the winter time, but not Petunia — the genial, versatile (and deodorized) entertainer who plays daily in summer to the hosts of youngsters at the Children's Zoo. In winter, Petunia goes on the road, playing regularly to school rooms all over Greater New York.

One day recently the staid residents of an Upper East Side street were somewhat put off balance when a taxicab drew up before the dignified portals of one of New York's better-known schools, the door opened, and out stepped Petunia and Jeffrey, an assured bantam rooster and the other half of the act. Together with Miss Ruth Dauchy, their chaperone, these accomplished Thespians entered the schoolhouse and the show was on. The photographic record follows.

Petunia and Jeffrey are perhaps best known among the Society's staff for their ability to stand

an unusual amount of public handling. On the day in question they were passed from hand to hand, and schoolroom to schoolroom with but a minor amount of protestation — entirely vocal and without any pecking or scratching. The pupils were far louder in the expression of their glee and interest.

Miss Dauchy showed a number of Zoo slides, answered many questions, and the little troupe had hard work of it to get away from the schoolhouse by noon.

This work is an extension project among the schools in winter when the Children's Zoo is closed. It has been necessarily held on a restricted basis during the war years. It is hoped now that it may be greatly expanded during the years ahead, becoming a regular feature in the curricula of all the schools of the New York area with the possibility of an extension service to many schools throughout the East.



ONE QUICK WAY of getting children over their timidity about animals is to seat them in a circle, turn the rooster or the skunk loose inside, and then ask everyone to make sure they do not escape.

ALL FEAR DISAPPEARED in the first few minutes, and thereafter the children vied with each other to see who would next get to hold Petunia and Jeffrey, for the pets are completely tame and friendly.





PETUNIA EXPLORED the whole classroom, to the vast delight of the children, and was especially fascinated by the desks because there were so many pencils and books she could push onto the floor.

QUESTION TIME always follows the talk and the inspection of the animals, and Miss Dauchy is sometimes hard put to it to keep up with the flood of questions about these and many other animals.



That's What We're Here For!

By **DONALD T. CARLISLE**

Chairman, Membership Committee

WE'VE STOPPED laughing at jokes about the GI who sent his little brother a kangaroo. If the animal landed anywhere near us, we are likely enough to receive a visit from him or, at the least, a multitude of questions about him.

We have to take visiting kangaroos — and many other creatures — seriously. For various reasons, we can't play host to many of these furred or feathered mascots from all over the world, but we do try to give sound answers to the questions which pile in on us about the care, diet and habits of a wide range of animal life — not alone mammals and birds, but reptiles, fishes and insects, too. Most members seem to have pets — and the more unusual the pets the better, native or foreign.

Oddly enough, at this moment the writer was interrupted by a member's telephonic S.O.S.: "Where can I buy my little boys a tame skunk?" This is a fairly easy request to answer, for, while skunks like Georgia peaches, are a short seasonal crop, and the 1946 harvest lies some time ahead, still there *are* skunk sources that can usually deliver at the appropriate time. It's the man who wants a spanking span of zebras or the fellow who seeks advice about a capybara farm in Trinidad who pose the \$64 questions!

Before leaving this skunk matter however, these animals when deodorized make charming and useful pets, and have a therapeutic value too. In the past, the Society has helped to find tame skunks for shell-shocked veterans who needed pets to restore them to normality. Our files show that raccoons also have helped in these readjustment problems. Parrots do not involve

us so heavily since there are both Federal and State regulations controlling the importation of parrot-like birds.

The Society staff has a fairly consistent call for information on pet sources. We do not deal in animals, of course, but it might certainly be classed as a membership privilege that we are usually able to tell whether or not most animal types are available and where. We spent some time recently attempting to track down an ant-mine for a famous author.

When it comes to the care of rare pets the Society's service is much broader. We have many questions regularly from members whose pet birds are songless or finicky about their rations. Mammals, reptiles and fishes call for the same attention.

There is always a great interest in reptiles. Snakes and snake skins, turtles and turtle-shells, and many photographs of reptiles come to us for identification. We have, particularly in spring, a great demand for information about the care of turtles, their hibernating and other habits. During the war, members wanted lists of poisonous snakes on Japanese Islands, Okinawa and New Guinea. At the same time, members want to know what branches of the snake family live in Nassau County, or the northernmost point of the rattlesnake's range.

One member wants to wipe out a den of copperheads. Another is content with information about the purchase of anti-venom serum so that he may keep a supply on hand. A veteran wishes to become a snake farmer, and some young men want to know where to study to be herpetologists.

Insects, alive and dead, come in to us regularly for identification. "How can Japanese beetles be exterminated?" "Where can ladybird beetles be purchased?" "What are the natural enemies of the housefly?" and "What is the best season to collect ant-colonies on Long Island?"

At the Aquarium, the staff members are equally busy answering calls for advice on the maintenance of home aquaria.

Now that spring is here again, we are preparing for the usual upturn in the curve of questions concerning bird identification.

So it goes. These requests come from everywhere; not just from New York and its vicinity, but from Alabama, Texas and California, from Trinidad and Cuba, Europe and the Pacific. Staff members are not concerned with individual requests alone. Questions come from leading magazines and newspapers, from columnists and radio commentators, from "Believe It or Not Ripley" and the "Book of Knowledge." The

Encyclopedia Britannica turns to the Society staff for much material on Zoological subjects.

The Society curators, veterinarian and laboratory scientists are busy enough these days, and we don't want to advertise their services too much in this connection. You won't find our "Pet Clinic" listed among your membership privileges for this reason. However, if your son *did* send you a kangaroo and you want to teach it not to leap on the dinner table, we just might have some pertinent information on the subject.

At all events, the New York Zoological Society seeks to be a live service organization, helpful to every member who needs advice in the matter of his more direct contacts with the animal world. Many people who come here for such help join the Society out of gratitude. Perhaps you know some non-members with pet problems who would feel the same way about us. If so, please send them along. That's what we're here for!

New Members of the Zoological Society

Life Members

J. J. Brodbeck
Benjamin Levi

David Rockefeller
Nelson A. Rockefeller

Annual Members

Charles Allen, Jr.
Jacqueline Andrews
Andrey Avinoff
Miss Joan Babcock
A. Beller
Frederick A. Bernhard
Cesar J. Bertheau
Dr. Louis Faugeres Bishop, Jr.
Frederick H. Blake
Juan Carlos Blanco, Jr.
William A. Bode
James Boehlke
Adolphe Boissevain
H. C. Bonfig
J. Dorothy Borgstede
Stanley B. Boswell
Donald C. Brace
Robert E. Broome
Robert A. Brown
Miss Penny Bryant
Jacques Cattell
Dan P. Caulkins
Miss Anne Cherr
Edward C. Childs
Harold T. Clark
Colonel Paul Cleveland
Stuart Cloete
Corrine Condé

Mrs. Wellington Cross
Kittridge B. Crumb
William Porter Davisson
Barbara DeLello
Mrs. May Donner
Elmer Dreher
Roy Sarles Durstine, Jr.
Perry B. Duryea
John Elliott
Guy Emerson
Lady Ewart
Milton J. Ferguson
(Brooklyn Public Library)
C. L. Flood
(Royal Zoo. Soc. of Ireland)
Grace S. Forbes
Herman Forster
Walter Frank
Joseph K. Franklin
C. E. C. Freyvogel
Mrs. Carl Funke
Hermann O. Ganss
Mrs. Louis C. Gerry
William S. Glazier
Dr. Frank Ward Goeller
Raymond B. Goodell
Mrs. David M. Goodrich
Nöel Graeber

Horace R. Graham
Ludlow Griscom
C. R. Gutermuth
Miss Emilie J. Guy
Robert J. Hamerslag
Miss Lisa Hamilton
Charles E. W. Hand
Charles C. Harris
Frank W. Hawley
Capt. H. Nugent Head
William Heinrich
Dr. G. A. Hinnen
Mrs. George G. Hoffman
Alfred C. Howell
Anna Hyatt Huntington
Elmer P. Hutter
Jack Isreeli
Francis L. Jaques
T. T. Johnson
Henry Kirkland Jones
Charles B. Kane
Mrs. Paul King
K. M. Krezek
(For Iowa State Conservation Comm.)
Sidney Landau
Frederick B. Lee
H. Maximilian Lester
Bert C. Libas

Mrs. Hugh Littlejohn
 Arthur H. Lockett
 Lawrence W. Lowman
 Howard P. Maeder
 Albert H. Marckwald
 Bradford L. Martin
 Herbert Martin
 Mrs. Fred Martini
 Lewis S. Maxfield
 H. Elliott McClure
 John P. McDermott
 Clifford W. McGee
 John V. McMaster
 Miss Susan Meek
 Dr. Karl Menninger
 Professor Z. P. Metcalf
 Cornelius von E. Mitchell
 Mrs. R. H. Morris
 Miss Marcia Motley
 J. T. Nillard
 Donald M. Oenslager
 Mrs. Henry C. Olmsted
 Harold Halsted Park, Jr.
 Mrs. Edgerton Parsons
 Miss L. S. Parsons
 Nathaniel Phillips
 Alexander R. Piper, Jr.
 John F. Plummer
 William B. Polites
 Miss Carolyn Ponsonby

Dr. Jean M. Press
 Horry F. Prioleau
 Francis L. Pruyn
 Dr. F. Morgan Pruyn
 Milton Lee Pruyn
 Harold T. Pulsifer
 James S. Putnam
 Grafton H. Pyne
 Miss Nancy Read
 Harold C. Richard
 Archibald M. Richards
 Lawrence Richey
 Edgar Rickard
 Mrs. Don T. Ries
 Thomas Rodd, III
 Mrs. Winslow J. Roehl
 Alfred Rossiter
 Miss Mary Rose
 Miss Virginia Fortune Ryan
 Mrs. William Schail
 William Scudamore
 George W. Serebrykoff
 James M. Shaw
 Mrs. Robert E. Simon
 Henry Sleik
 Miss Nellie M. Smith
 Mr. Leo Spichler
 Mrs. Richard A. Springs, Jr.
 Walter N. Stafford
 Samuel Stanley

Alfred T. Staples
 Mrs. Helen Smith Steers
 Dr. Arthur Stein
 Frank Stephen
 J. P. Stetson
 William A. W. Stewart
 Edwin A. Stumpp
 Hon. Vincent J. Sweeney
 Mrs. Bertha A. Taddiken
 Mrs. J. Dinsmore Tew
 David W. Thatcher
 Mrs. Robert H. Thayer
 Mrs. William B. Titley
 Miss Beatrice Allen Tobey
 E. W. Townsley
 Joseph Valenti
 Cornelius VanderPyl
 Mrs. Margery L. Van Norden
 Mrs. H. Weinkauff
 Alfred R. Whitney
 Mrs. George Whitney
 Mrs. Throop M. Wilder
 Professor Joseph L. Williams
 George M. Wolfson
 Mrs. William R. Wolter
 Mrs. Julian L. Woodward
 Dr. Arthur F. Wright
 Dr. Carl Wurm, Jr.
 Rev. P. H. Yancey, S.J.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

President Osborn and Mr. Tee-Van Speak in Mid-West

As a result of the Zoological Society's deep interest in conservation, President Fairfield Osborn was asked to address the joint convention of the National Association of Biology Teachers and the American Association for the Advancement of Science at St. Louis on March 30.

On the following two days Mr. Osborn and Mr. Tee-Van spoke before large audiences in Cleveland, under the auspices of the Cleveland Museum of Natural History, which is endeavoring to expand and modernize the Cleveland Zoo.

Dr. Nigrelli and Mr. Coates have been appointed members of the Atlantic States Marine Fisheries Commission to investigate the possible harmful effects of the dumping of sulfuric acid waste off New York and New Jersey.

Work in Progress

Our plan of working piecemeal to improve and modernize the existing facilities and exhibits in the Zoological Park, pending the start of large-scale expansion of exhibits, is in full operation this spring. The Small Mammal House was closed in February for a complete remodeling, the inmates being housed temporarily in the Animal Hospital and the African Plains Lion House.

Another major "make over" job will be started in the lobby of the Reptile House this spring, to prepare facilities for a display of insects. Both jobs are expected to be completed in time for opening on Members' Day.

Mr. Bridges will be one of the five judges of the American Humane Association's motion picture contest for amateurs this spring.

“Guide Book” and “Snake Book” Are Now In Print Again

After being out of print for many months because of the paper shortage, the Guide Book to the Zoological Park is again in stock and copies may be obtained from any restaurant or souvenir stand in the Zoo, or by mail. Greatly increased printing costs have made it necessary to set a price of 75 cents on the Guide Book, postage included.

A new publication of the Zoological Society is “Snakes of the Northeastern United States” by Clifford H. Pope, Fellow of the Zoological Society and Curator of Reptiles of the Chicago Natural History Museum. Mr. Pope’s well-illustrated and authoritative booklet replaces a former publication of the Society, “Serpents of the Northeastern States,” by the late Dr. Raymond L. Ditmars, which has long been out of print. The new booklet, of 52 pages and 33 illustrations, including the Timber Rattlesnake and Copperhead in color, sells for 50 cents.

“Jimmy” Set a Record

Jimmy, the Shoebill, first of its kind in the United States and probably the best-known bird in the Zoological Park, died on January 10 at the age of at least 19 years, 3 months and 6 days, having set a longevity record apparently unequalled outside its native Egypt.

The autopsy performed by Dr. Goss revealed that Jimmy died of a chronic kidney ailment, and that “he” was a female — a fact hitherto unsuspected, since male and female Shoebills are identically colored and marked. Jimmy came to the Zoo on October 4, 1926, from a Presbyterian missionary station in the Sudan.

Those “Baby” Tigers

The staff of the Zoo still calls them the “baby” Tigers, but the adjective may have to be modified shortly. While it is true that the three Tigers, born on February 8, 1944, are by no means full grown, their weights as recorded on their second anniversary definitely take them out of the baby class.

Rajpur tipped the scales at 438 pounds, Rani-ganj at 436, and “little” Dacca at a mere 311 pounds. Despite their size, the “babies” are al-

most as playful as when they were truly babies of twenty pounds and they would like nothing better than to be visited, in their compartment, by their foster mother, Mrs. Fred Martini, wife of the Lion House keeper. However, for more than a year Mrs. Martini has not had closer contact with them than affectionate pattings through the wire front of their compartment. While there is little danger that the young Tigers would purposely injure her, their very size and activity present a danger.

How to Handle An Electric Eel And Not Get a Shock

An interesting observation on the method employed by natives of Surinam in handling Electric Eels has been received by Curator Coates of the Aquarium from Max R. Kent, secretary of the Surinam Educational Society of Paramaribo. Mr. Kent wrote after reading an account of the New York Aquarium’s work with Electric Eels in a recent issue of *Newsweek*.

“The Electric Eel is frequently found in some parts of the country,” he wrote. “The spots they favor most are between the stones of the rapids in our sweet water rivers streaming down from the interior. That is, however, not the most interesting thing about them, and the fact that they are eaten by the natives living in the interior is also not the most remarkable. What to my way of thinking is most striking is that these people seem to have found a way to handle this miniature powerhouse barehanded without getting hurt or encountering any shocks at all.

“When an eel is caught they beat the trunk of a moko-moko (*Montrichardia arborescens*) — which grows here on the banks of most rivers and swamps—into some sort of a brush. The eel is then gently beaten with the broom so that its body is all covered with the liquid substance of the moko-moko. After this treatment the eel can be picked up with the bare hands.

“A native holds in his left hand a moko-moko plant and with his right takes hold of a live, good-sized eel without apparently feeling a shock.”

Not having a branch of moko-moko (generally spelled mucka-mucka) handy, Curator Coates continues to use heavy rubber gloves while handling his Electric Eels.

400 At Conference Session Led by President Osborn

Some 400 delegates to the Eleventh North American Wildlife Conference and members of the Zoological Society attended the general session on "Conservation Education" at the Hotel Pennsylvania on March 12, of which President Osborn was chairman.

Mr. Osborn's opening address forms the editorial in this issue of *ANIMAL KINGDOM*.

Fontainebleau Is Saved

Early last year President Osborn protested to the Secretary of War against the use of the great Camargue and Fontainebleau Biological Reserves in France as bombing and artillery sites, and was assured that bombing would be stopped immediately in the Camargue, and that the use of the Fontainebleau Forest for artillery practice would be investigated.

Last fall Mr. Osborn made further inquiries and belated assurance has been received that before the end of the year all activities in Fontainebleau were restricted to a very small training program (150 troops) and that no artillery or bombing practice was being carried on there. All American activities were removed from the forest by January 1 of this year.

"Mr. and Miss STorK"

The letter — in pencil, on creased and crumpled paper torn from a school notebook — was addressed quite simply and directly:

Mr. and Miss STorK

BroNK Zoo

Delivery of the letter posed no problem to the Postoffice, and we opened the envelope to read:

Mr. AND Miss STorK I WANT you TO BriNg my moThER BABy TWiNs GiRLS. I WILL MiND ThEM For her. I AM surE you WiLL HElp.

GAiL

Gail forgot to give her address, and so the letter remains unanswered. But the Zoo's storks are very busy this spring and our reply would surely have been a disappointment to our little correspondent.

Mr. Coates has been elected a Fellow of the New York Academy of Sciences.

Expedition No. 46

Since mid-February the staff of the Department of Tropical Research has been in Venezuela on the forty-sixth expedition of the Department. Following up last year's expedition at Rancho Grande, Dr. William Beebe, Miss Jocelyn Crane, Mr. and Mrs. Henry Fleming and Kenneth Gosner are collecting data on jungle life and working out new techniques in collection and field studies. The forty-sixth expedition—the second to Rancho Grande—is again made possible by the cooperation of the Venezuelan Government and the Creole Petroleum Corporation.

Six books by present or former members of the Zoological Society's staff have been selected by Edwin Way Teale, naturalist and nature writer, for inclusion in a recommended "100-volume nature library" listed in a recent issue of the *Audubon Magazine*. The books are: "Pheasant Jungles," "Jungle Peace," "Edge of the Jungle" and "Galapagos: World's End," by Dr. William Beebe; "Thrills of a Naturalist's Quest," by Dr. Raymond L. Ditmars; and "Camp Fires in the Canadian Rockies," by Dr. W. T. Hornaday.

PUBLICATIONS OF INTEREST

THE LOST WOODS. By Edwin Way Teale. Dodd, Mead & Co., New York, 1945. pp. XIII+317, 200 illus. from photos. \$4.00.

Two hundred photographs in a single volume should make a picture book, especially when the photographs have been made with such consummate skill in the choice of subject and composition. Actually, however, "The Lost Woods" remains a "reading" book. It has no real continuity, for it is a series of thirty essays on as many phases of Nature, liberally besprinkled with anecdotes. But while there is no actual cohesiveness of word or action, the chapters are closely strung on a thread of feeling that dominates them all. It is the nostalgic sense disclosed with delicacy and feeling in the title chapter. It is the story of a grown man who revisits a northern forest and tries, in vain, to recapture the fascination of a childhood memory. In stories of the sea-shore, of Florida, of other forests, the sense of the author's search is always present. His readers will hope that more such books will follow before his quest is ended. — LEE S. CRANDALL.

MAN-EATERS OF KUMAON. By Jim Corbett. Oxford University Press, New York, 1946. 235 pp., 6 illus. \$2.00.

For a good many years Col. Patterson's account of East African adventures, "The Man-eaters of Tsavo," has been held up as the classic story of lion-hunting. Jim Corbett's "Man-eaters of Kumaon" is about tiger-



TELEVISION IS COMING to the Bronx Zoo over the Columbia Broadcasting System's "video" bands if the technical "bugs" in the operation can be removed. Television waves require line-of-sight transmission to the Chrysler Tower in mid-town New York, or else some way must be found to "bounce" them from obstructions. Engineers are working at the Zoo this spring, planning a summer program.

hunting and (to this reader, at least), is about twenty-five times more exciting than the older classic.

Major Corbett appears to have spent several years in the pursuit of man-killing tigers in the Kumaon hills of the United Provinces of India. He hunted with understanding and consummate skill, sometimes with desperate necessity when man-eaters were decimating native villages.

This is no mere tiger-killing-for-sport book. Corbett has a "feeling" for tigers; even a strong liking for them. His accounts of various famous man-killers are unpretentious but (truly) thrilling.—WILLIAM BRIDGES.

THE DINOSAUR BOOK. By Edwin H. Colbert. American Museum of Natural History, New York, 1945. 156 pp., numerous drawings, diagrams and photographs. \$2.50.

To write a lively, sparkling, yet informative book about animals that vanished from the earth sixty million years ago, would seem to be a hopeless task. Numerous rather dismal efforts to accomplish the feat serve to establish the point.

In "The Dinosaur Book," Dr. Colbert has accomplished the impossible. A definitely dead subject has come to life with an unexpected rush of vigor that is both delightful and refreshing — if such adjectives may properly be applied to Dinosaurs!

A touch of humor at the beginning and a dash of the romance of fossil hunting lead by pleasant steps to more serious consideration of the primitive creatures, many of huge proportions, that roamed the earth so long ago. By every imaginable means — excellent photographs, sketches, diagrams, the sterling restorations of Charles R. Knight — the illustrative story is told. And the text itself could well be used as a model for making dull stories bright.—LEE S. CRANDALL.

THE ELECTRIC EEL WENT TO WAR

Continued from Page 75

other nerve chemical, acetylcholine. The potency of the catalyst may be measured by the number of units of acetylcholine it can split in a given period. A typical brain type of choline esterase can split a few units of acetylcholine in one hour.

Electric Eel choline esterase can be prepared in such a way that it splits up to 78,000 units in one hour.

Furthermore, this preparation is practically pure and specific — not a mixture of different kinds of esterases, as brain extracts may be.

The electric eel is a marvelous tool for studying the chemical mechanism of nervous tissue and the way animal electricity is produced.

It appeared to the Army and the scientists associated with the investigations of diisopropyl fluorophosphate that in this potent extract from the electric tissue of the Electric Eel, they had

an excellent means of studying the effect of fluorophosphate on choline esterase. With diisopropyl fluorophosphate they could inhibit nerve activity; with choline esterase from the Electric Eel they could obtain valuable information about the interaction of these two compounds.

Once destroyed by DFP, nerve activity is gone beyond recovery. The war gas is too effective—at least, too effective to be used where there was any possibility that it might attack our own troops.

The war is over now, and DFP and the choline esterase extracts are a part of Chemical Warfare history. But the research goes on. The mechanism of nerve activity was the subject of an international symposium in New York in February. It will be discussed at another great scientific gathering in Atlantic City in March. These peace-time conferences are open to the public, no longer cloaked in secrecy. There will be more such conferences, more work in the laboratories, to find out how nerves function in health and in such diseases as epilepsy and many other nervous diseases. Studies on choline esterase — much of it extracted from the Electric Eels in the basement of the Bronx Zoo's Lion House — will probably contribute largely to the answer, if there is one.

IT WAS RUGGED FOR WILDLIFE, TOO

Continued from Page 57

Wake Island, Eniwetok, Tarawa and many others subjected to heavy attacks probably lost a large part of their resident bird population, some species permanently, and wildlife on such islands as Guadalcanal has undoubtedly suffered much. Numerous letters from men in the armed forces tell of needless and often wanton destruction of wildlife in various parts of the world. It will take much time to gather this information together into a comprehensive outline of the losses and the possibilities for restoration.

Altogether the cumulative bad effects of the war seem to me to far outweigh the temporary gains in populations mentioned above. Much effort will be required to compensate for the destruction of water and land habitat. War seems to be bad for wildlife and fish as well as for man.

5751673
257

ANIMAL KINGDOM



THE MAGAZINE OF
THE NEW YORK ZOOLOGICAL SOCIETY

NEW YORK ZOOLOGICAL SOCIETY
General Offices: 630 Fifth Avenue, New York 20, N. Y.

PRESIDENT
Fairfield Osborn

FIRST VICE-PRESIDENT
Alfred Ely

SECOND VICE-PRESIDENT
Laurance S. Rockefeller

SECRETARY
Harold J. O'Connell

TREASURER
Cornelius R. Agnew

EXECUTIVE COMMITTEE
Laurance S. Rockefeller, *Chairman*

Cornelius R. Agnew
Alfred Ely
De Forest Grant

Warren Kinney
William De Forest Manice
David H. McAlpin
Robert Moses

Harold J. O'Connell
Fairfield Osborn
J. Watson Webb

BOARD OF TRUSTEES

Class of 1947

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez

De Forest Grant
Eugene Holman
Warren Kinney

Henry R. Luce
William De Forest Manice
Harold J. O'Connell

Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1948

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely

Marshall Field
Childs Frick
Archer M. Huntington

David H. McAlpin
John H. H. Phipps

Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Class of 1949

George C. Clark
F. Trubee Davison

Jay Downer
Robert I. Gannon

Robert Gordon McKay
Fairfield Osborn

Laurance S. Rockefeller
John M. Schiff
Frederic C. Walcott

Ex-Officio, The City of New York

The Mayor, Hon. William O'Dwyer

Commissioner of Parks, Hon. Robert Moses

STAFF

GENERAL

John Tee-Van *Executive Secretary*
Jean Delacour *Technical Adviser* Herbert F. Schiemann *Comptroller*
William Bridges . . . *Editor & Curator, Publications* Sam Dunton *Photographer*
Myrtice A. Blatchley . . . *Associate in Charge, Department of Education*

ZOOLOGICAL PARK

Lee S. Crandall *General Curator*
Brayton Eddy . . . *Curator of Reptiles & Insects* Leonard J. Goss *Veterinarian*
Edward Kearney . . . *Manager, Facilities Dept.* Grace Davall . . . *Assistant to General Curator*
Quentin Melling Schubert, *Superintendent, Construction and Maintenance*
W. Reid Blair *Director Emeritus* William Beebe *Honorary Curator, Birds*

AQUARIUM

Christopher W. Coates . . *Curator and Aquarist* C. M. Breder, Jr. . *Research Associate in Ichthyology*
Ross F. Nigrelli *Pathologist* George M. Smith . *Research Associate in Pathology*
Myron Gordon *Assistant Curator* Homer W. Smith . *Research Associate in Physiology*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*
Jocelyn Crane *Research Zoologist* Henry Fleming *Entomologist*

Associates

William K. Gregory
John Tee-Van

Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

VOL. XLIX

JUNE 3, 1946

No. 3

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York 20, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York 60, N. Y. Title registered with United States Patent Office.

Subscription, \$2.50 a year; single copy, 50 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

GOING NATIONAL

THIS YEAR, for the first time in its history, our institution is to take an active part in the administration of enterprises serving the public outside New York City. It is a significant step, reflecting the fact that the work of the Society is becoming, to an ever-increasing degree, national in scope.

The most important of these enterprises is the Jackson Hole Wildlife Park in Wyoming upon which work will be started this summer. This project will give to visitors from all over the country a view, in natural surroundings, of the majestic array of animals of the great West — Elk, Moose, Buffalo, Mule Deer and Antelope — and an understanding of the measures necessary to preserve these animals in their wild state. At the same time steps will be taken to inform the public concerning the great need for preserving forests, for safe-guarding watersheds and for maintaining the inviolability of primitive and wilderness areas. In other words, this project will be an all-around-the-circle Conservation activity.

Nearer home, arrangements have been concluded with the Palisades Inter-state Park Commission whereby the Society, working cooperatively with the Commission and the American Museum of Natural History, will assist in the reorganization and redevelopment of the Trailside exhibitions at Bear Mountain Park on the Hudson. Again, as at Jackson Hole, methods of informing the public regarding Conservation needs will be integrated with the wildlife exhibits. This project will provide a working contact with upward of two million people a year.

In another category, the Society is engaging itself, with other Conservation groups, in a plan for the establishment of a permanent refuge in Humboldt County, California, for the last remaining herd of Roosevelt Elk in that State. A part of the proposed refuge area contains a superb forest of primeval redwood trees — an interesting circumstance, since the officers of the Society helped to start the movement to save the redwoods more than twenty-five years ago.

It is extremely stimulating to realize that opportunities like these are coming our way.

Fairfield Osborn

IN THIS ISSUE

King of Africa-in-the-Bronx	H. Huber Clark	COVER
Young Lion on the African Plains, New York Zoological Park		
Giants in Armor	Brayton Eddy	91
A Rare Bird Walks Again	Leonard J. Goss	95
The Bats of Carlsbad Caverns	Ernst Christensen	98
The Sentimental Approach	William Bridges	104
A Curious Display Form of a Curious Bird	Lee S. Crandall	108
Pumps Are a Problem, Too	Christopher W. Coates	111
Around the Zoo With the Headkeeper of Mammals	William Bridges	113
Behind the Scenes: News and Notes		117

JUN 6 1946



GIANTS NOW AT THE ZOOLOGICAL PARK. THESE TORTOISES, THE LARGEST 330 POUNDS, WERE MERE "BABIES"

GIANTS IN ARMOR

By **BRAYTON EDDY**

CAUGHT in the sloughs of ages past are the petrified bones of reptiles long since extinct. Discards of a former era. The Ichthyosaurus, Stegosaurus and Tyrannosaurus perished when they failed to meet the demands placed upon them by an expanding fauna. Over-specialization was their downfall. They over-specialized in bulk and armor at the cost of speed and maneuverability. Now they are also-rans, following in the tragic footsteps of the Woolly Mammoth, the Saber-toothed Tiger and others of their ilk.

A reptile that faced extinction yet managed to survive is the Giant Tortoise. Once it ranged abroad in the United States and India, in Germany, France and possibly Brazil. But because it sought protection rather than escape, its range now is limited to isolated islands in the Indian and Pacific Oceans. From wide distribution during the Tertiary Period it has shrunk within historic times to the cramped confines of the Aldabra Archipelago, north of Madagascar, and the Galápagos Archipelago off the west coast of Ecuador.

These islands, previous to the advent of the white man, were lacking in the more aggressive types of predatory animals and therefore offered a safe haven for reptilian conservatism.

But since the Sixteenth century the lot of the Giant Tortoises has not been a happy one. Seamen have slaughtered them for their meat and oil and have left dogs, cats, rats and hogs to run wild and take an unmerciful toll of their eggs and young. Only the adults, equipped with heavy armor, have been able to escape, and these are fast disappearing.

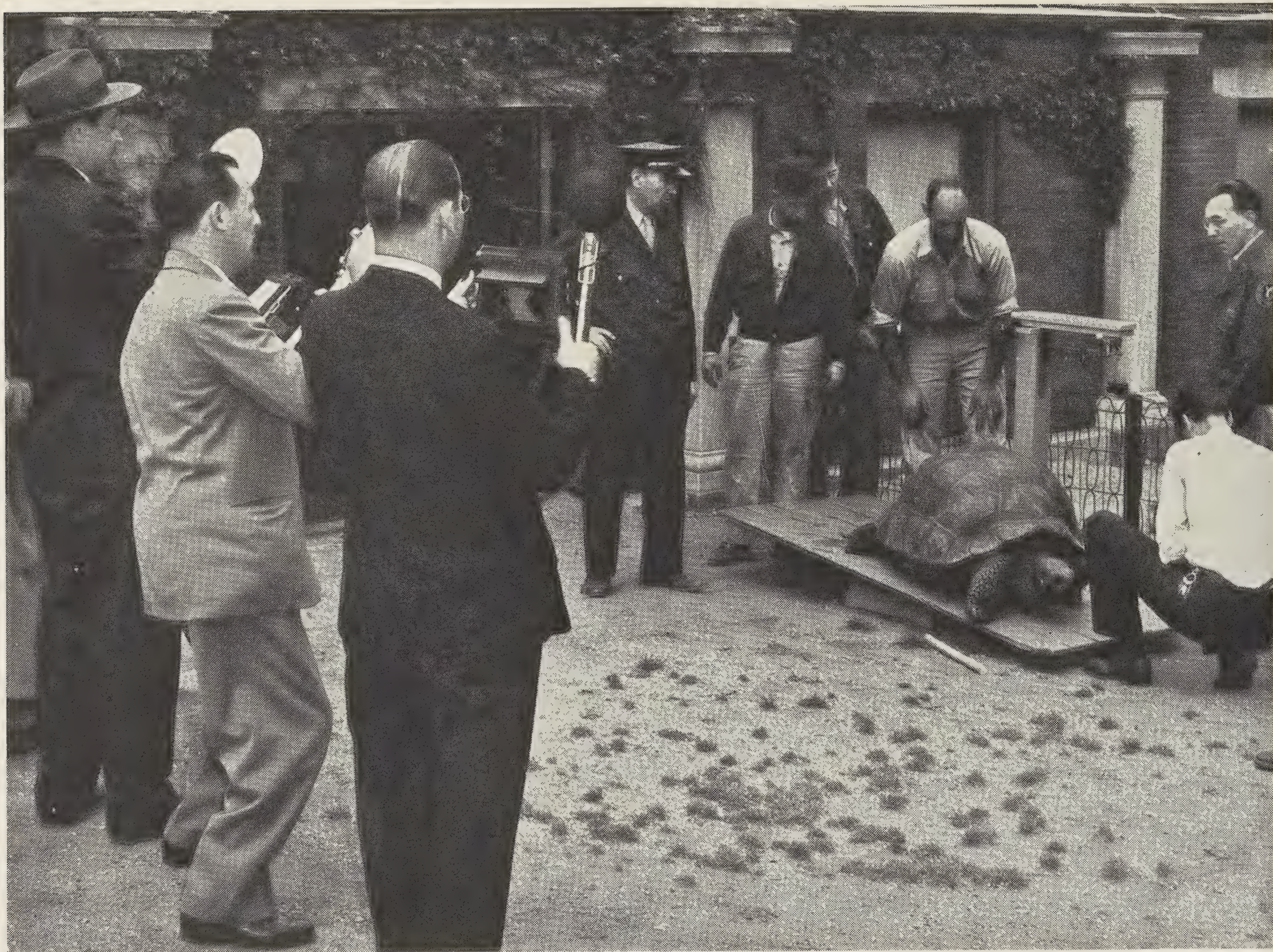
Except for their isolated position and early freedom from predators, the Galápagos Islands would not seem to be the most favorable spot to

make a last stand. They comprise some 24 named islands lying just south of the equator. On a clear day most of them are within sight of each other, but separated from the mainland by an ocean channel more than five hundred miles wide and two miles deep. The largest island is but seventy-two miles long and its nearest in size only twenty-five miles in diameter.

Water is the chief problem. All the islands are of rugged, volcanic formation fringed with coral. Their coastal regions are extremely dry and barren, the high interiors—sometimes reaching an elevation of 4,000 feet—alone capable of supporting plant life by reason of low-lying clouds and irregular rains. There are more than 2,000 extinct craters in the group. Some of the islands, once heavily populated with tortoises, are totally lacking in water except for rain caught in temporary pools. Only the larger islands have springs, which are located in inaccessible areas approached by climbing over loose, knife-edged rocks and fighting through a tangle of upland vegetation.

It is astonishing that Giant Tortoises, hampered by short legs and heavy armor, are able to navigate this territory. Yet their urge for water and plant food makes periodic pilgrimages from coast to interior absolutely necessary. Broad trails, worn smooth by centuries of slow progress up and down the mountain craters, serve as mute evidence of their habits. It is these same trails, radiating inward and upward from the shoreline, that informed thirsty explorers of the location of springs and incidentally of the presence of tortoises.

The earliest explorer is said to have been a Spaniard named Fray Tomas de Berlanga. He discovered the islands in 1535. Later his compatriots were so impressed by the vast numbers of



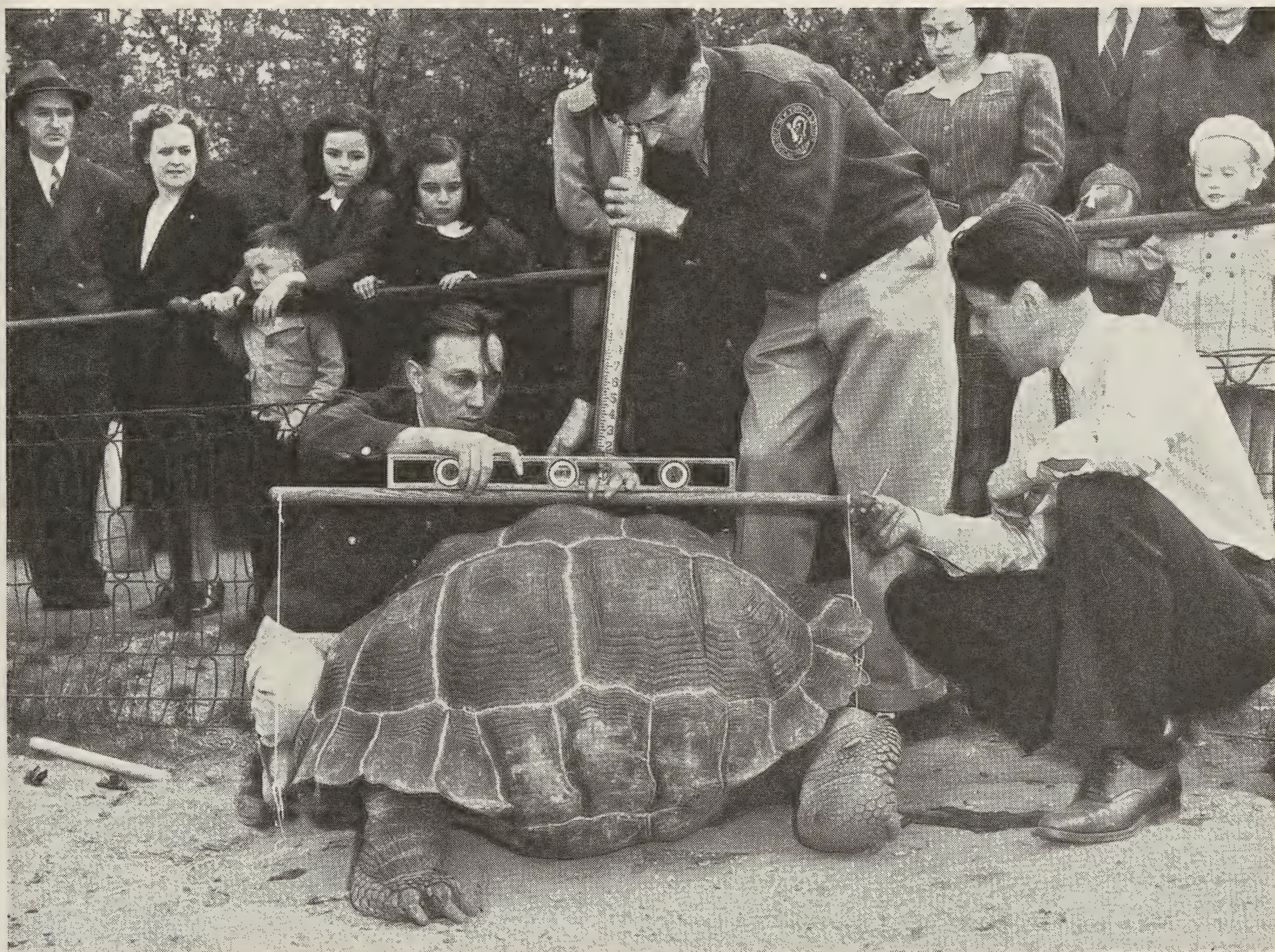
WEIGHING THE GIANTS on their arrival in the Zoological Park this spring from North Miami was a hot and heavy job. While newspaper photographers took pictures of the proceedings, Curator Eddy and keepers hoisted the Tortoises onto the scales. The largest specimen weighed an even 330 pounds.

tortoises they encountered that they gave the archipelago the Spanish name for these creatures — Galápagos. Merchantmen of many nationalities began using the islands as a way station, mostly to replenish their stocks of food and water, and they were closely followed by buccaneers. Meat-hungry, they seized tortoises where they found them. Later, if an order came to clear the decks for action, the tortoises were thrown overboard. Sometimes they would bob about like corks for several days, stretching their long necks high to avoid drowning, until recovered by the victors for food.

During the War of 1812 the American and British fleets spent some time in Galápagos waters playing hide-and-seek among the land masses, and incidentally stocking their larders with "tortoise mutton." In the 1820s the fur sealing fleets were active.

But previous to the establishment of the first settlers upon the islands in 1832, it was the American and British whaling vessels that took the greatest toll. Only the discovery of petroleum in 1859, and the Civil War following, put a stop to their activities. Often one vessel would carry away as many as 300 large tortoises, and the average per vessel was 122. From logbooks of 102 whaling vessels that sailed between 1811 and 1884, examined and faithfully tabulated by the late Dr. Charles Haskins Townsend, the total number of tortoises taken from the Galápagos Islands was 15,831. Yet it is known that during this period there were more than 700 vessels in the American whaling fleet alone. What must have been the slaughter, if all the records were available?

These tortoises were not killed until needed for fresh meat. For the most part they were nei-



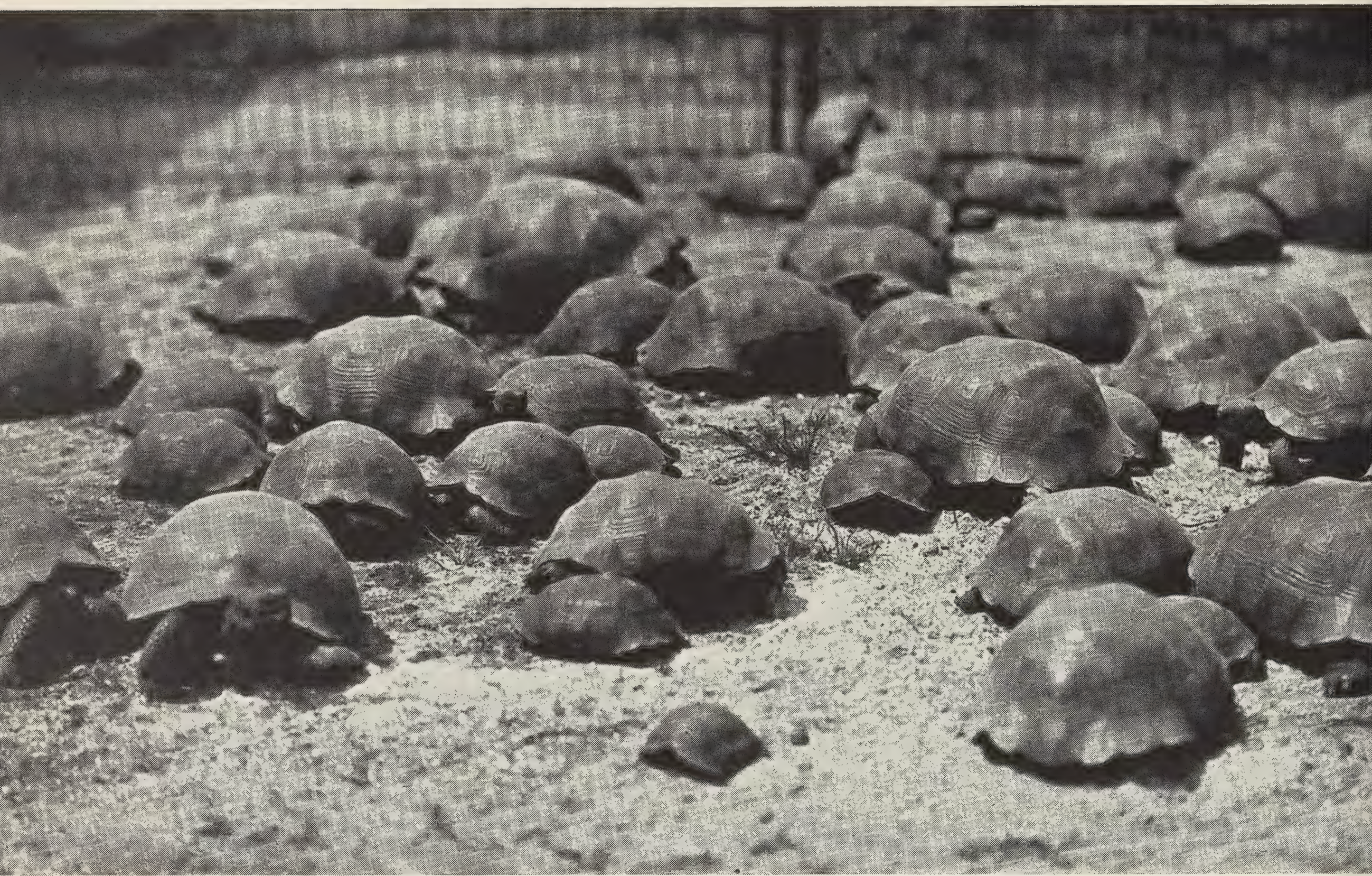
RECORDS OF SIZE included length and girth as well as weight, and each of the newcomers was measured when the weighing was completed. The largest of the Florida specimens measured 51 inches "over the hump," and is considerably larger than any of the giants the Zoo already had on exhibition.

ther watered nor fed, and it is known that sometimes individuals were still alive even when the ship reached its home port after eighteen months. This would seem impossible were it not for the fact that these tortoises have a special reservoir, at the base of the neck, which is capable of holding three gallons of water. No doubt it is these reservoirs which enable them — like camels — to survive in regions where water is present only at rare intervals.

When Charles Darwin visited the Galápagos Islands during the voyage of the *Beagle* in 1835, the tortoises had been preyed upon by man for 300 years and had been carried away for food by the hundreds of thousands. Yet their numbers were still impressive. Perhaps no other wild animal, with the exception of the American Bison, ever played so important a part in the food supply of man.

Darwin refers to the tortoises as "huge reptiles, surrounded by black lava, leafless shrubs and large cacti that seemed to my fancy like some antediluvian animals." As a matter of fact, they are entirely vegetarian, living for the most part upon succulent cacti and coarse grasses. The spines of the cactus do not seem to bother them in the least.

One explorer likens their actions to that of cattle. They gather about water holes, drinking, then slowly disperse to nibble at short grass. During the heat of the day they commonly wallow in shallow pools or rest in the shade of low bushes. They are very determined travelers and once started in a given direction are difficult to turn from their course. Only in courtship are they inclined to be quarrelsome, when males will utter a suppressed guttural sound and rise on tip-toes, stretching their long necks to the utmost, to



ONE HUNDRED AND EIGHTY Giant Tortoises were collected on Albemarle Island in 1928 by Dr. C. H. Townsend, on an expedition sent out by the New York Zoological Society. This is a part of the "herd" — forty-eight of the Tortoises — while the collection was awaiting colonization in the southern States.

bite at the heads of their adversaries. In these fights, however, it is seldom that anyone gets hurt.

The eggs of the Giant Tortoise are about the size and shape of billiard balls, and the shells are unusually hard. In sandy soil the female will dig a hole with her stubby feet and lay several eggs, then cover them over. Nearby she will make other nests. When the ground is rocky, eggs are dropped indiscriminately. Unlike marine turtles, Giant Tortoises use no vegetation in their nests.

It was really the advent of settlers that brought the sharpest decline in tortoises. In their ceaseless quest for oil, the settlers did not hesitate to gather about water holes and slaughter the monsters as they approached for drink. Each large tortoise would yield from one to three gallons. The fat containing the oil would be cut from the creature's sides and the flesh discarded, except what was wanted for immediate consumption.

In 1879 there was known to be 1,200 gallons of oil awaiting shipment, mostly for cooking purposes, at a price of nine dollars per 100 pounds; and presumably this was only a small part of the "take" of the oil industry for that year.

Whereas seamen avoided the larger animals because they were too heavy to handle, it was precisely these animals that were considered most valuable by the oil hunters. With introduced predators destroying the eggs, the Giant Tortoises on the Galápagos Islands were headed for total eclipse.

By 1928 they had been erased from nine of the eleven islands where they once ruled supreme. Since each island had its own species, found on no other island, and only the largest island of Albemarle had more than one species, several forms had already become extinct. It was for the

Continued on Page 119



WATTLED CRANES LIKE A MARSHY PLACE FOR THEIR NESTS, AND A RAINY SPRING PROVIDED A SPOT TO THEIR
 WALKING IN THE CENTER OF THE AFRICAN PLAINS ANNEX. THE EGG WAS DEPOSITED ON A LOW MOUND.

A Rare Bird WALKS AGAIN

By LEONARD J. GOSS

THE DAY the young Wattled Crane broke its leg, there was palpable gloom around the Bird Department. We were doomed to bad luck, it seemed, in our efforts to rear this rarest of cranes.

In 1944 our pair hatched a chick, the first of this beautiful African species hatched in captivity, but it succumbed after four months to a vitamin A avitaminosis. Now we had another chance — and at the age of almost 10 months the chick had somehow broken its leg.

Obviously, if the veterinary department had any influence with healing nature, now was the time to exercise it. We ordered the young crane

THE FEMALE WAS ASSIDUOUS IN HER CARE OF THE
 EGG AND HERE SHE HAS RISEN TO TURN IT

AT THE AGE OF THREE WEEKS THE CHICK SELDOM
 WANDERED AWAY FROM ITS MOTHER'S SHADOW





WHEN THE BROKEN LEG WAS DISCOVERED, THE BIRD WAS RUSHED TO THE ANIMAL HOSPITAL

carried to the Animal Hospital for an immediate X-ray examination.

The condition was bad enough. It was a compound fracture of the tarso-metatarsus of the right leg and where the skin had been broken, dirt and sand had worked in.

For an hour we picked débris out of the wound, then washed it thoroughly in salt solution, alcohol and ether. When we were reasonably sure there was no chance of infection under the bandages, the bones were set together, the leg wrapped in muslin, and a splint of soft, curved zinc (tailored in the machine shop) was

THE SPLINT IN PLACE. FOR THE FIRST FEW DAYS THE CRANE LIMPED AND MOVED AWKWARDLY



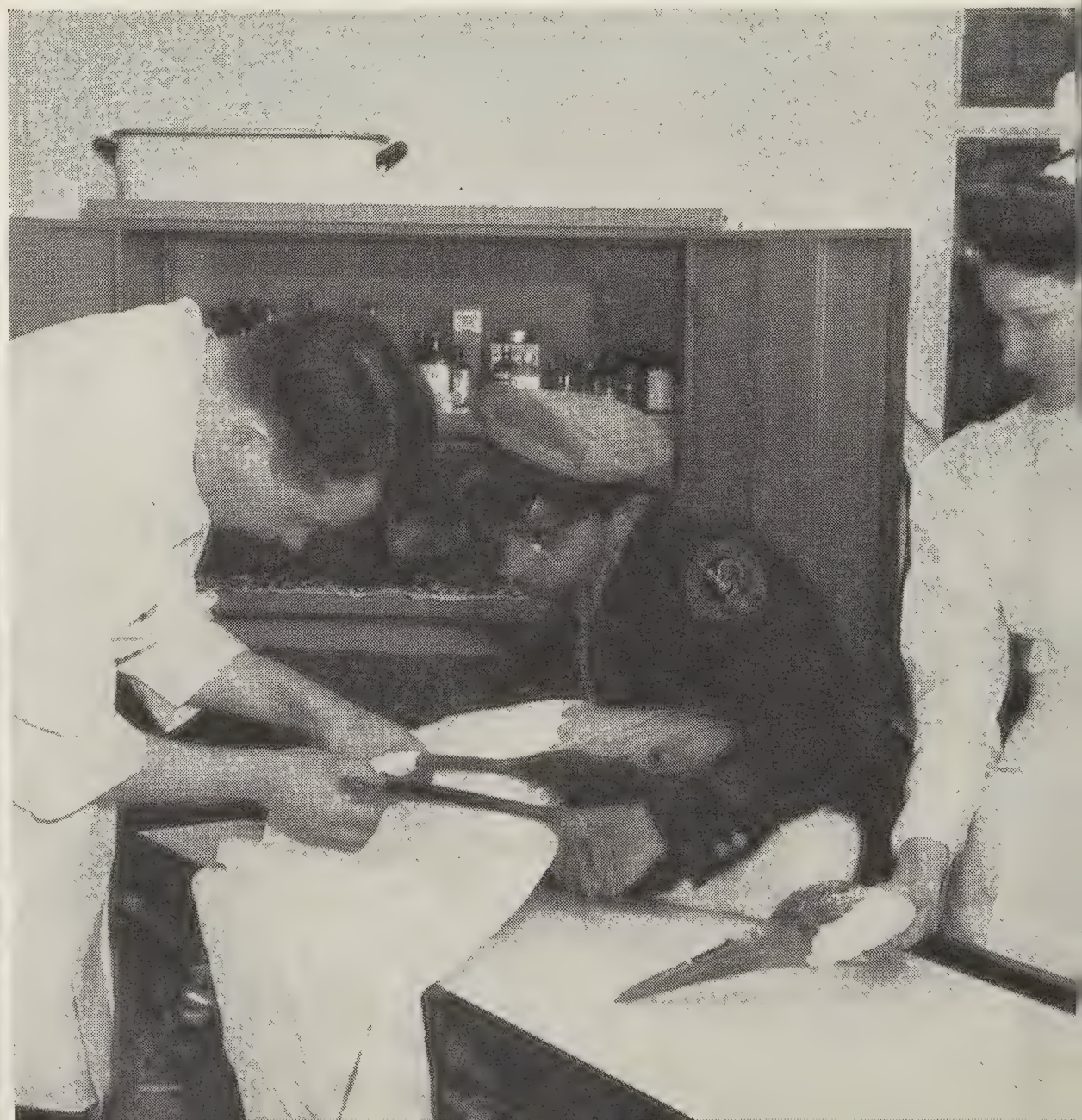
AFTER THE FRACTURE WAS CLEANSED, A METAL SPLINT WAS CAREFULLY TAPED AND BOUND ON

bound on. From that point onward, it was up to nature to take over.

For the first day or two the long-legged bird was awkward in handling its injured leg. Then, like a man on crutches, it became more adept and moved with comparative freedom. After two weeks we removed the splint for another X-ray examination and found — to our pleased surprise — that the bones were healing nicely.

The splint was re-applied for another week. Once more it was removed for examination, and at this time the healing was complete. Today the young Wattled Crane is "as good as new."

WITH ALL THE CARE THAT A FRACTURE DEMANDS THE SPLINT WAS REMOVED FOR EXAMINATION





AMINATION SHOWED THAT THE INJURY WAS HEALING WITHOUT INFECTION AND IT WAS DECIDED TO
 KE AN X-RAY PICTURE OF THE BONES, TO DETERMINE IF THEY WERE KNITTING IN A STRAIGHT POSITION

THE ZOOLOGICAL PARK'S VETERINARIAN STUDIES
 THE X-RAY PICTURE OF THE HEALED FRACTURE

AS GOOD AS NEW! THE YOUNG CRANE, ITS LEG
 HEALED, STRIDES AROUND ITS OUTDOOR CORRAL





Photo National Park Service—Kennicott

WITH A MUFFLED ROAR a black cloud of bats bursts from the throat of the Carlsbad Caverns on summer evenings. For a few minutes they literally fill the twilight sky as they wheel, begin to disperse.

The BATS of Carlsbad Caverns

By **ERNST CHRISTENSEN**

*Park Naturalist
Carlsbad Caverns National Park*

ON SUMMER EVENINGS, shortly before sundown, expectant visitors gather at the entrance to the famous Carlsbad Caverns in southeastern New Mexico. A Cavern Guide begins to talk about bats—the bats of the Caverns, whose awe-inspiring evening flight, if he has timed his talk just right, will come as a spectacular climax to his remarks.

“... and so, ladies and gentlemen, any moment now you may expect —”

A muffled roar, so distinctive of a milling mass of bats, wells out of the Cavern and then, suddenly, the black cloud of bats bursts into the open. With practiced sureness they follow a counter-clockwise spiral and four trips around the throat of the hundred-foot hole lift them high enough to clear the southeastern rim of the

Cavern entrance. Almost invariably the dense, funnel-like column makes its way due south to an escarpment 200 yards away. Here the ascending air currents boost the fluttering wings for hundreds of feet and the oscillating, meandering flight pattern breaks up into isolated groups.

"They look like puffs of smoke!" someone cries.

With surprising speed the "puffs of smoke" thin and disappear, scattering, fading, dissolving in all directions as the bats head for their feeding and watering places. The nightly drama of the bat flight has commenced.

* * *

AT THE BEGINNING of this article, I remarked that the flight comes as a climax of the Guide's talk "if he has timed his talk just right."

The timing is not easy and never a certainty. For years the guides have faced the problem of guessing just when the bats would fly. They have tried to correlate flight time with sunlight exposure, temperature, humidity, air pressure, previous precipitation and apparent food supply — all to no avail. Recently the time of flight has been found to be remarkably dictated by the immediate location of the bat colony within the Bat Cave. Frequent observations have indicated a close correlation between the earliness of the flight and the nearness of the colony to a fissure in the Bat Cave's ceiling. Through this fissure light streams from the late afternoon sun. Perhaps by being nearer to this, the only real source of light in the Bat Cave, the bats there are more aware of the approach of evening. But getting into the Bat Cave is no easy matter, so the guide still bases his guess on the flight time of the previous evening. Generally this proves successful — the guide finishes his talk, the bats fly and everybody is happy; but sometimes just when the talk is well started the bats fly, or more frequently the guide finishes his talk and is forced to apologize on behalf of the bats for an embarrassing half hour's wait.

The groups that assemble to watch the flight are composed of cavern visitors and as such are a rather typical sample of Americans, generally. Their knowledge of bats is remarkable for its paucity, a situation which is not really surprising considering how little is known about bats, even by mammalogists. The guide invariably has to assure visitors that bats are not dangerous, that

they don't get into one's hair, that they don't lay eggs. Furthermore, he has no hesitation in admitting a tremendous lack of detailed knowledge about these flying mammals.

The vast majority of the bats making up the flight are Mexican Free-Tailed Bats (*Tadarida mexicana*), a cave-dwelling, highly gregarious and rather sub-tropical species. They seem to typify a species making an invasion of temperate regions from their sub-tropical habitat. They come to the higher latitudes during the frost-free insectivorous season, but retreat to the south with the approach of cold weather. Though they are quite hardy and can survive extremely cold temperatures by going into short periods of hibernation, most of them migrate southward as winter approaches.

This seasonal north-south migration is not their only one. They seem to have developed a lateral-interseasonal migration in search of more copious hunting areas. In the semi-arid regions of the southwestern United States the insect supply, to some extent, is limited by the amount and nature of the rainfall, and its distribution. The night-flying insects that comprise most of the bats' food supply — moths, beetles, and so forth — are particularly affected by local precipitation. Thus, following prolonged droughts when the food supply becomes scarce, these bats, to extend their feeding areas, seem to develop a cave-to-cave rotational type of migration.

Since these bats migrate and because they are almost always in the dark, many of their habits have never been observed by man. Mating has never been witnessed but is thought to occur in their southern winter retreat. The young bats, usually only one to each mother, are probably born about the first week in July. Where they are born is still a question. Pregnant females are in the flight, but no mothers either carrying young or showing indication of suckling have been observed. Significantly, the sex ratio shortly after the young must have arrived indicates a high preponderance of males, and the females present seem to be barren. No colony of young bats has ever been found in, or out of, the Bat Cave. Perhaps maternity wards are established in exclusive caves, or perhaps expectant mother bats isolate themselves to rear their young.

The bats from Carlsbad Caverns range over a

wide area during their nocturnal flight. How far can only be surmised by estimating the speed of their flight, multiplying it by their time aloft, allowing for wind drift, and subtracting both time lost for water- and rest-stops and the million-and-one deviations from a bee-line flight. Generally it is agreed here that the bats feed within a fifty-mile radius, that their best feeding grounds are in the irrigated Pecos Valley to the east, but that they range in all directions from the cavern entrance. Certainly the bats consume prodigious amounts of food. Their extremely high metabolic rate and the nature of their food make it necessary that they consume quantities of insects equal to, or even exceeding, that of insectivorous birds. Various estimates are current — ranging from one-eighth ounce to three ounces per bat per night, and all assuming optimum feeding conditions.

Certain anatomical and physiological features of the bats can be seen and are known. The flight mechanism is very ingenious and can be seen, studied and explained. In flight, however, the manipulation of the wings and the tail membrane is too rapid to observe. Stroboscopic motion pictures of these maneuvers might add much to the field of air dynamics. The presence of a supersonic sound system of flight direction in bats has been demonstrated in the laboratory, the sounds recorded, the pitch measured; but what a chaotic bedlam of supersonic squeaks and echoes there must be in a cave corridor when the millions of bats swirl there! Bats have eyes and can see, but what do they see? Their tiny beady black eyes certainly do not show that specialization for seeing in feeble light so characteristic of other nocturnal, predatory mammals; and yet bats are almost constantly in the dark. Their sense of smell is apparently well developed. The olfactory lobes are comparatively large. Certainly the secretion of that poignant heavy perfume by the bats must be some part of their communication system. But by what sense — by what combination of senses — do they range so far, feed, return by the clock, and find the cavern entrance in darkness and fog to dive in from high altitudes at such terrific speed?

The flight of the bats figures in the human history of Carlsbad Caverns. This area was the land of the Apaches. They knew of the bats

and the cavern entrance. They made camp and hunted here. The Indian paintings in the entrance to the cave may have been theirs, or they could be an attempt by an even earlier man to record something about the bats. No one has yet deciphered those pictographs.

The white man's first penetration of this region probably should be credited to the Spaniards, although they failed to record either the bats or the caverns. Travelers using the old Butterfield trail during the 'sixties, on their way to and from the "diggins" in California, came within six miles of the caverns. They stopped for water and to change horses at Rattlesnake Springs, only seven miles away. Bat flights can easily be seen from those springs. It can be assumed that these early wayfarers saw the flight — that some out of curiosity came to investigate the spectacle. What they saw and their impressions were not set down.

The first permanent settlers were the cattle ranchers who came into the area around the 'eighties. They, too, must have been attracted to the cavern entrance by the flight of the bats. But again, no records.

Stories about the "Bat Cave" began to appear during the 'nineties. Men of the law blamed the "Bat Cave" on their failure to bring in various miscreants alive. Jim White, the first explorer of Carlsbad Caverns, says that the bats first attracted his attention to the entrance before his initial descent of 1901. Following Jim White's first descent and early explorations, the chief interest in the caverns was directed to the huge guano deposit in the Bat Cave section. In subsequent years some fifty thousand tons of this valuable fertilizer were removed and shipped to California. The guano mining operations were continued intermittently throughout the forty years that private interests had control of the Bat Cave and only ceased when the National Park Service secured control of that area in 1941.

The part of Carlsbad Caverns occupied by the bats is an awesome spectacle — enormous and almost completely dark. Because of the long period of the bats' habitation, it is discolored from urea and guano. The walls, the rocks, and especially the ceiling, are stained a dirty brown — almost a black. Guano mats the floor. The stench of the guano and of the bats permeates everything.



Photo National Park Service—Kennicott

FORERUNNERS of the thousands of bats that will begin to pour out in a few minutes. These, exceptionally, came out of the cave when it was still light enough to take fast photographs of them in flight.

The entire cave, but especially the guano on the floor, is crawling with vermin — mites, crickets, beetles and moths. The bat colony suspended from the ceiling far overhead is hardly discernible against the rock. It is a compact, squirming, squeaking mass of life somewhat resembling an enormous swarm of bees at rest. Groups of bats constantly disengage themselves from the mass to flutter swiftly, but surely, through the darkness. The speed and the strength of the innumerable wing-beats produces a muffled roar not unlike the sound of a distant waterfall. Directly beneath the colony there is a constant rain of pellets and urine droplets. The Bat Cave is not an attractive place for any but the interested few.

There are many other bat caves in the semi-

arid Southwest. Most of them are found from central Texas westward through New Mexico and Arizona to southern California, and from Oklahoma southward across the Rio Grande far down into Mexico — perhaps even as far as Central America and the Yucatan peninsula.

Texas has some of the largest and most interesting bat caves. Guano has been mined from the tremendous, multi-apertured Rio Frio cave for more than a century. Nitrates extracted from guano at this cave are said to have supplied much of the gunpowder for the Confederate armies during the War Between the States. Huge quantities of guano still remain, for miners in this cave seem to contract a violent disease, and mining operations have not been completed.

Perhaps the largest colony of bats in the United States has its summer residence in the famous Nye Cave near Hondo, Texas. It has been estimated to number some ninety million individuals, and the evening flight lasts for as much as five hours. The rather small Bracken Cave, near San Antonio, is a virtual gold mine, for the easily mined ninety-ton annual crop of guano sells at an average price of \$40 a ton. Another profitable enterprise was the bat cave near Sanderson, Texas, until flooding ruined it. Carloads of guano shipped to California on the Southern Pacific Railroad give a clue to the distribution of the numerous bat caves and indicate that many caves in Mexico, too, are producers. The Bat Cave at Carlsbad Caverns, then, is not unique as a producer of guano, although it is unusual in the accessibility of its flight spectacle.

* * *

AS IF IT WERE A SIGNAL, the first appearance of the bat flight each evening reveals that the human visitors are not alone in their vigil. Out of seemingly nowhere appear the hawks to add their bit to the drama of the scene.

The Red Tail soars in at high altitude, finds his point of aim far above the ascending column of bats and dives in on folded wings. The very power of his dive usually is the undoing of his hungry purpose, for the meandering of the column frequently moves the intended target many feet to the side, and the hawk finds that he has pounced on empty, but perfumed, air. After several such beautifully spectacular but futile attempts, the Red Tail either leaves in dignified disgust or resorts to the clumsy but more fruitful tactic of flying right into the middle of the column, where sooner or later some unfortunate bat flies into his clutches.

The attack of the Swainson's hawk is far more underhanded. He flounders listlessly under the column but his every grab produces a bat for his

supper. Spectators are likely to be puzzled by the seeming casualness of his attacks.

The foray of the Sharpshin is, of course, accomplished with his usual speed, but surprisingly lacks the deadliness attributed to this habitual predator. Perhaps the very number of the bats confuses him; perhaps he becomes indecisive in his choice of victims, for so often he approaches the column in the usual, powerful, overtaking flight, then veers away to alight on a nearby sotol stock in baffled meditation. But it is another story when an individualistic-minded bat breaks away from the column.

The huge Horned Owl is the most persistent and successful bat hunter. He makes an appearance as darkness approaches. His method of approach and his attack are direct and unreflective. Directly at the densest available spot in the column he flies, and then literally hurls himself feet foremost into the mass. More times than not he succeeds in his venture.

The bat flight may continue uninterrupted for more than an hour, but the spectacle that it produces is freed from monotony by those interesting side shows; by the change of intensity, flight pattern, direction of flight; by the occasional appearance of albino bats. The spiralling mass of individuals gradually seems to become a single, solid struggling thing. It is so unbelievably prolonged, the number of bats so infinitely great, that it dulls the imagination.

As night cloaks the spectacle with the robe of darkness, visitors leave, group by group. Each is filled with awe at the thing he has seen. All know that here at Carlsbad Caverns National Park are two things — a geological exhibit of indescribable beauty and magnitude, and an awesome zoological spectacle. Both merit national recognition and both deserve the lasting preservation they have in the surveillance of the National Park Service.



FIRST DAY OF SPRING on the African Plains, and the Zoological Park's herd of Nyalas celebrates by a wild race around the Waterhole. Such activity is unusual, for the antelopes generally take life calmly, but they invariably run and leap and exercise their legs the first day out after winter indoors.



ADULTS MAKE OBEISANCE TO CHILDHOOD WHEN THEY ENTER THE CHILDREN'S ZOO

MAKING

The Sentimental Approach

By WILLIAM BRIDGES

CHILD PSYCHOLOGISTS warn us against the sentimental approach to children. We adults (they say) must not be taken in by young and shining faces, by ecstatic cries and rapt attitudes. The idea seems to be that while children *are* endearing, they can't help being so, and thus they shouldn't gain credit for it.

Not being child psychologists and therefore not knowing any better, the staff of the Zoological Park is daily and completely captivated by the spontaneous delight of young visitors to our Children's Zoo.

For thousands of them it must be a first introduction to living animals, to crows that talk, ducks that quack, goats that bleat (and butt), to



SPECIAL PRIVILEGE OF THE YOUNG AND (IF THEY WISH HARD ENOUGH) PERHAPS THE DREAMS COME TRUE

pigs and chickens and llamas and donkeys. It is our duty to make the introduction easy and pleasurable on both sides, for we are generating impressions that may well determine a child's future relations to all animal life.

"Mouseville" is a new installation in the Children's Zoo this year. Against a cleverly-painted backdrop of a village street ("Cheese Factory," "Hole-in-the-Wall Nite Club," "Mickey Mouse in 'Trapped'" at the movie), vari-colored mice are continually scampering. We liked it — but would the children like it? The first visitor was a 5-year-old girl.

"Oh!" she said. "Look!"

That was all she said. But it was enough.

DOCENT SERVICE BY THE POWDERPUFF TWINS





SWARMING, SCAMPERING GUINEA PIGS ARE ALWAYS FASCINATING



PORTRAIT OF A YOUNG MAN STARTLED

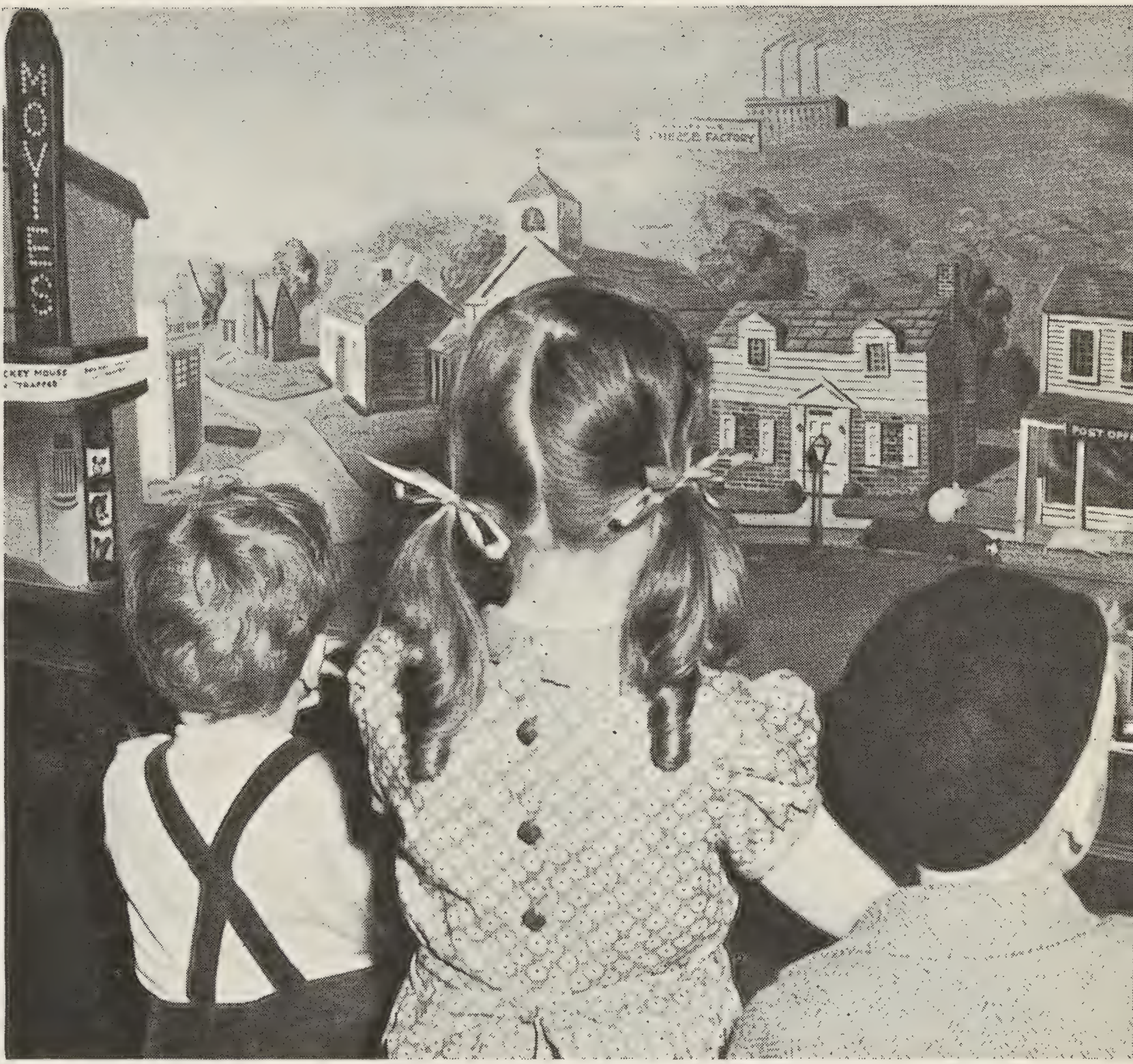
INVESTMENTS MUST BE THOUGHT OUT CAREFULLY

NO THRILL EQUALS HANDLING A LIVELY SKUNK





COUNTER WITH A TALKING CROW



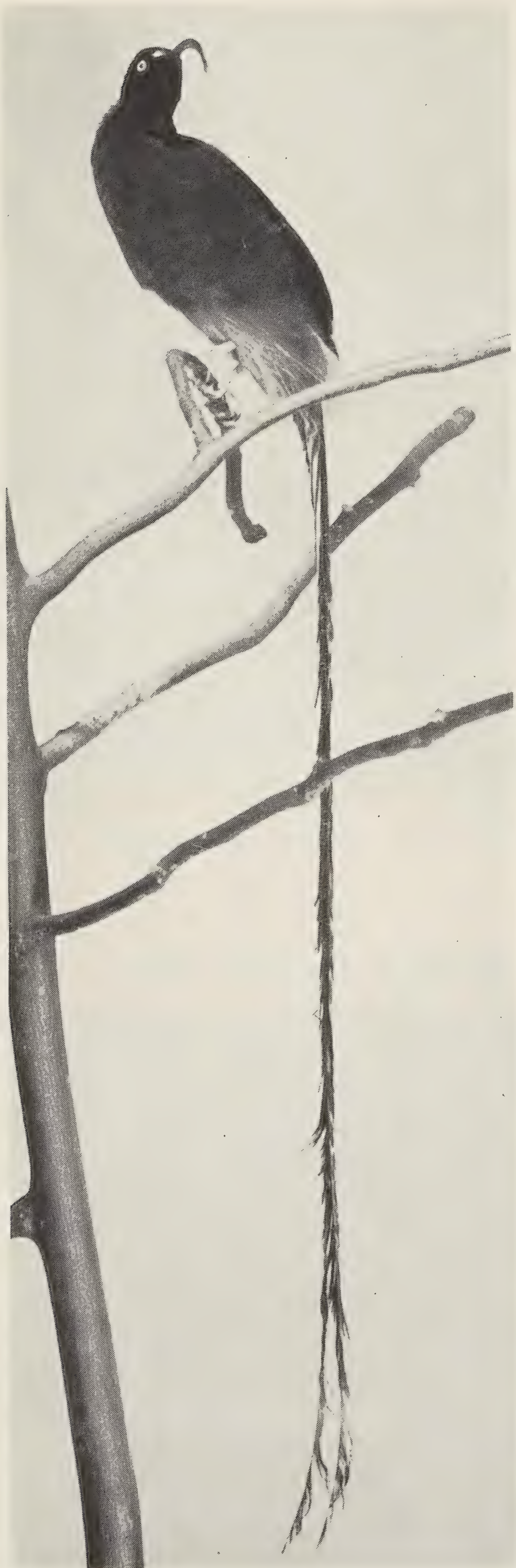
"MOUSEVILLE" IS AN UNEXPECTEDLY SENSATIONAL FAVORITE

T HAPPENED OFTEN UNTIL BILLY WAS TIED UP



SOUVENIR OF AN HOUR'S FUN — A C.Z. MEDAL





SPECTACULAR both at rest and in display is the Long-tailed Bird of Paradise. **LEFT** — The bird in normal position, with its pectoral shields hidden. **RIGHT** — Raising the pectoral shields for display. This is only one stage in the display of this particular bird; it was the climax of another specimen.



A Curious Display Form of a Curious Bird

By LEE S. CRANDALL

MANY CURIOUS, interesting and beautiful creatures are to be seen in a great zoological park like ours. But a large majority of our visitors have time for only a passing glance, so much that is of surpassing interest and beauty is missed. We do not want these things to be missed — we want them all to be seen by everyone. Usually, there is no other barrier than time and patience. Unfortunately, these are barriers that cannot be surmounted by the casual observer.

Since 1929, except for one year, a large cage in the northeast corner of the Main Hall of the Large Bird House, has been occupied by the Long-tailed Birds of Paradise (*Epimachus m. meyeri*). In those seventeen years, there have been only two males and one female. Yet they have furnished material for three technical papers in *ZOOLOGICA** relating to their courtship display forms, their molts and the laying of the first known egg of the species.

Each year, from October to April, the marvelous displays of the males have been performed daily. Many people, of course, through chance or grim determination, have seen this wonderful thing. But how many millions — actually millions — have gazed and walked on, unknowing. If only we could make them pause!

The male Long-tailed Bird of Paradise is somewhat smaller than a crow in body but its slender, curved bill and extended tail give it a length of about three feet. It is black above, with patches of intense green iridescence on its lower back and head. The breast is gray-brown, with over-lights

* Notes on Certain Birds of Paradise. Crandall. *Zoologica*, Vol. XI, No. 7, 1932.

Description of an Egg of the Long-tailed Bird of Paradise. Crandall. *Zoologica*, Vol. XXVI, No. 9, 1941.

Further Notes on the Display Forms of the Long-tailed Bird of Paradise, *Epimachus meyeri meyeri* Finsch. Crandall. *Zoologica*, Vol. 31, No. 3, 1946.

NEAR THE CLIMAX the pectoral shields meet above the head, while the outer tail feathers are rapidly opened and closed. They are open here.



FULL CLIMAX comes when the Long-tailed Bird of Paradise has expanded its plumes to their fullest and flattened its body. Then the long, curved beak is opened wide to show the yellow interior of the mouth. This remarkable series of photographs — the first of its kind ever taken, so far as we know — was made in the Zoological Park by Sam Dunton, our staff photographer, after a week of patient waiting.

of violet. Short, straggly plumes soften the break from body to tail.

There are two principal forms of display. In one, the body is turned slightly upward, in a nearly horizontal position and broadly flattened. The short flank plumes are spread and purple lights play over the brownish breast, but the general effect is not spectacular.

It is the upright form that is really worth waiting for. The bird sits quietly on his perch, calmly preening his plumage. It is then that we see that there are two long pectoral tufts or shields, which ordinarily are kept tucked well out of sight. Now they are held loosely upright, receiving, each in turn, a prolonged arrangement by the long, slender bill. All this preparation seems unnecessary but it is done with definite intent. For at the supreme moment, each feather must fall perfectly into place.

Suddenly, as we watch, the bird stiffens on its perch, flattens its body and throws the pectoral plumes upright above its head. And now we note a remarkable fact. For, while our two birds are known to have come from points within fifty miles of each other in the mountains of southeastern New Guinea and presumably belong to the same subspecies, the climactic forms differ. The first bird, collected in the Central Division of Papua by the Society's expedition, drew his extended shields together and held them upright like two fingers, with at least an inch of space between them.

The second bird was taken by Mr. Shaw Mayer near the Waria River, about fifty miles to the northeast. When this bird displays, the shields are broadened to the utmost, so that they join in a wide fan, closely encircling the head. So overpowering is the effect of this spectacle that the most experienced observer, seeing it for the first time, surely would not set down accurately just what had taken place. It was only after we had watched a number of times that we saw that a curious, convulsive movement of the body was causing the short outer tail feathers to open and close alternately, like the leaves of a fan.

Here we have two birds, presumably identical, one of which showed what seemed to be a primitive display form that is fully developed in the other. Only extended observation in the field will solve this problem.

Pumps Are a Problem, Too

By CHRISTOPHER W. COATES

THE MEN behind the tanks of the New York Aquarium live in a world of meaningful little sounds. Their ears are attuned to the silky purr of small electric motors, the shriller cry of the large ones, the liquid glub-glubbing of the air-lift pumps that keep alive the circulatory systems and boost the water on its endless round, from tank to filter and back to tank.

The pumps are ever on their minds. They hear without appearing to listen to the voices of moving water, and any break in the whispered rhythm jars them as the jangle of an alarm bell would startle us. When something is wrong, they run to the pumps, led by ear to the seat of the trouble. There are only two things to do: repair the pump and restore the normal flow of water quickly, or cut in the reserve pump that stands waiting for just such an emergency.

This long preamble says just one thing: that pumps, common and ordinary motor-driven pumps, are the very heart of an aquarium and (for certain special reasons) the No. 1 super-problem of the staff of the New York Aquarium.

Usually it is a surprise to visitors to the Aquarium to learn how important are the circulation of water and the maintenance of a "balance" of temperature and chemical content.

"Why do you have to 'baby' your fishes so much?" I was asked the other day. "Lots of people keep goldfish in a little bowl or a tank and they live for years without any particular fuss."

The answer to that one is, that small fishes which will live in home aquaria are usually from waters in which there is considerable change from season to season—it is warm, with a relatively heavy concentration of dead leaves, fish wastes and the like in the summer and fall; it is cool and has a lighter concentration of decaying

Life in the Aquarium tanks depends upon the smooth functioning of the machines that keep the water always circulating.

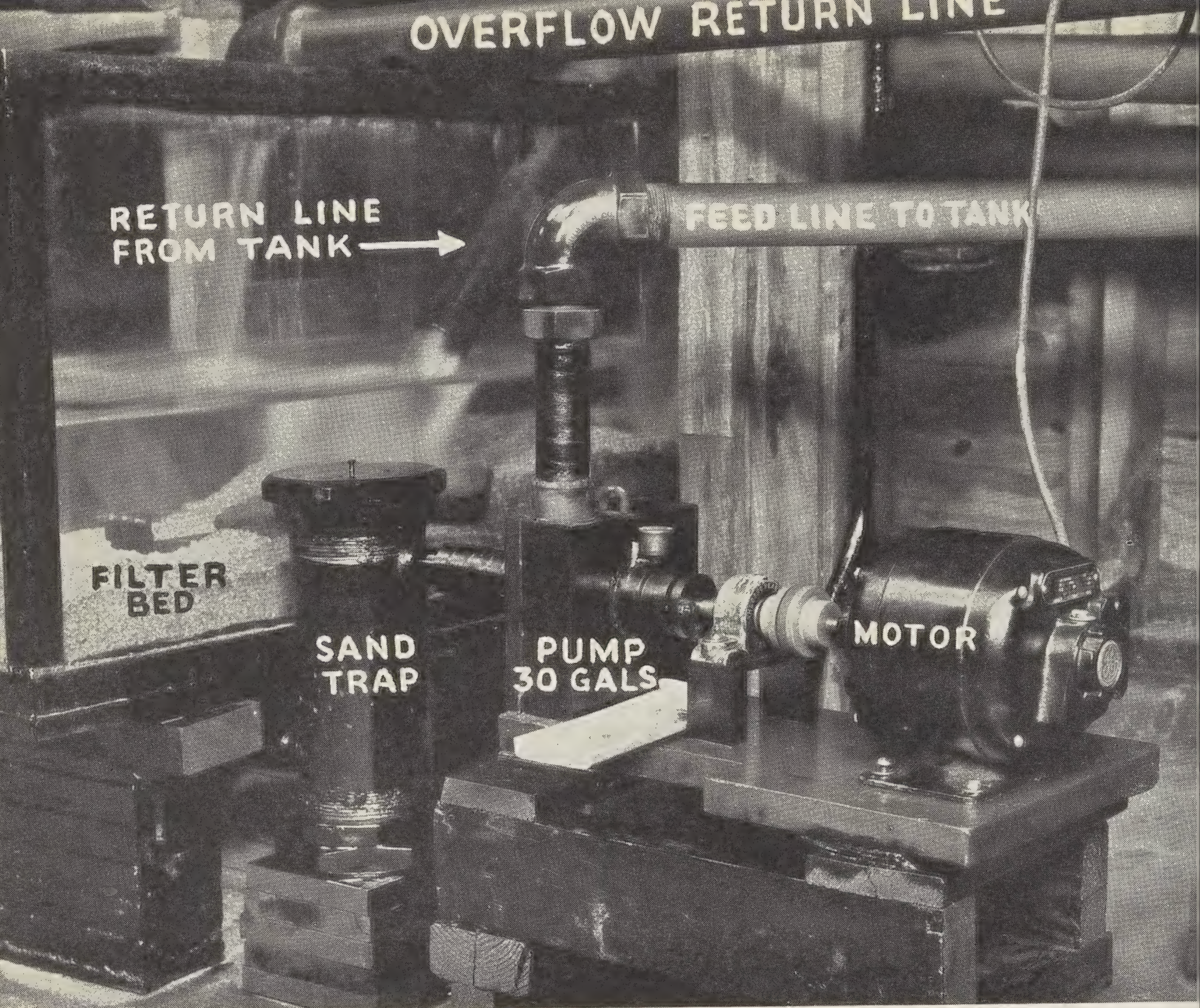
matter in the winter and spring. Through thousands of generations fishes from these waters have developed a tolerance for changes that would be fatal to fishes without their adaptability.

Certain kinds of fresh water fishes and virtually all salt water fishes have not developed that kind of tolerance and furthermore are accustomed to truly enormous bodies of water in proportion to their own body size.

We can't, physically, give them the whole ocean or a whole river, creek or lake to swim in. So we offer an acceptable compromise by giving "intolerant" fishes as large a tank as we can, to swim in, and another tank of extra water, hidden away somewhere under the exhibition tanks. That's where the pumps come in: they circulate the extra water through the exhibition tanks, and the constantly changing water gives the fishes the "illusion" that they are living in much more spacious quarters than they actually occupy.

Circulating water is fine for the fishes, but hard on pumps, even though pumps are normally supposed to do just that sort of job. The difference between pumping water in an aquarium and in, say, a city water system is that "fish water" is loaded with all sorts of chemical and biological substances that may attack and dissolve the moving parts of the pump and the piping that carries the water.

The standard pumps for non-aquarium work are made of bronze or iron. But the amino acids from fish wastes in "fish water" will rapidly take the copper out of bronze, leaving the tin residue



HERE IS THE HEART OF THE AQUARIUM—RATHER, ONE OF THE MANY PARTS THAT HAVE TO BE KEPT IN OPERATION CONSTANTLY. THE HARD RUBBER PUMP, A COMPARATIVELY SMALL ONE, WAS MADE BY THE STA

as a spongy mass without strength. Furthermore — and this is of the utmost importance to those of us who try to keep fishes alive — the dissolved copper makes an extremely poisonous compound in the water that flows from the pump into the tanks.

Iron will not make poisonous compounds, but it rusts so quickly that it becomes useless. Even the rustless types of iron or steel alloys will be attacked by water from fish tanks — not usually to the destruction of the machinery, but surely to the hurt of the fishes.

It is possible to find pumps made of glass or stoneware. These are dissolved very slowly by the water and last a long time; moreover, they give off no poisons. But glass and stoneware pumps are made only in comparatively small

sizes, not nearly large enough to handle the immense volume of water that must flow through a big aquarium, and even small glass and stoneware pumps are almost prohibitively costly.

I mentioned earlier in this article certain special considerations that added to the pump problem of the New York Aquarium. We have known certain other Aquarium people, particularly in the mid-west, to look at us in amazement when we have discussed our pump-and-pipe worries, and to take us behind the scenes and point out hundreds of feet of copper pipe and scores of bronze pumps.

"We've been using copper pipe and bronze pumps for years," they say. "What's the matter with you fellows?"

Continued on Page 120



HEADKEEPER SCHILLING USUALLY STARTS HIS DAY BY MAKING A ROUND OF ANIMAL INSTALLATIONS TO CHECK ON THEIR CONDITION. HERE HE WATCHES ANTELOPES ON THE AFRICAN PLAINS.

Around the Zoo With the Headkeeper of Mammals

By WILLIAM BRIDGES

IF THE New York Zoological Park were a small town, Gus Schilling would be comparable to the Chief of Police, Captain of the Fire Department, Board of Health Inspector and Truant Officer. Plus a few other positions for which there is no exact parallel.

Gus is the Zoological Park's Headkeeper of Mammals, the working liaison agent for General Curator Lee S. Crandall. He is the eyes and the ears of the department, the expert in handling unruly animals, the deviser of ways and means for doing the impossible.

How does one become Headkeeper of Mammals in a big Zoological Park? Gus Schilling's way was to start at the bottom, as a day laborer, in 1928. The following year the Mammal De-



**SCHILLING MAKES FRIENDS
EASILY—IMPORTANT WHEN
THE VETERINARIAN WANTS
TO EXAMINE A PATIENT**



**THE HEADKEEPER MIXES A
SOLUTION OF COPPER SUL-
PHATE TO DISCOURAGE AL-
GAE IN THE SEALION POOL**



**LAUNCHING A NEW ANIMA-
—A SEALION HAS ARRIVED
FROM CALIFORNIA AND IS
LIBERATED IN THE ZOO**



**LOOKS LIKE PLEASURE RATHER THAN BUSINESS—BUT THE HEADKEEPER IS MAKING FRIENDS WITH THE GAYAL
CAUSE IN A FEW DAYS HE WILL HAVE THE JOB OF MOVING HER AND HER CALF TO A NEW CORRAL**

partment needed a temporary Keeper and Schilling was a likely prospect. Within a few months he had demonstrated good judgment, a sincere liking for the animals under his charge, and ingenuity in handling them. His position was made permanent, and as the years passed he worked successively in all the mammal buildings — obviously the best of training for the Headkeepership

that fell vacant in 1942, for Headkeepers are supposed to know all the answers to all the problems that are certain to arise.

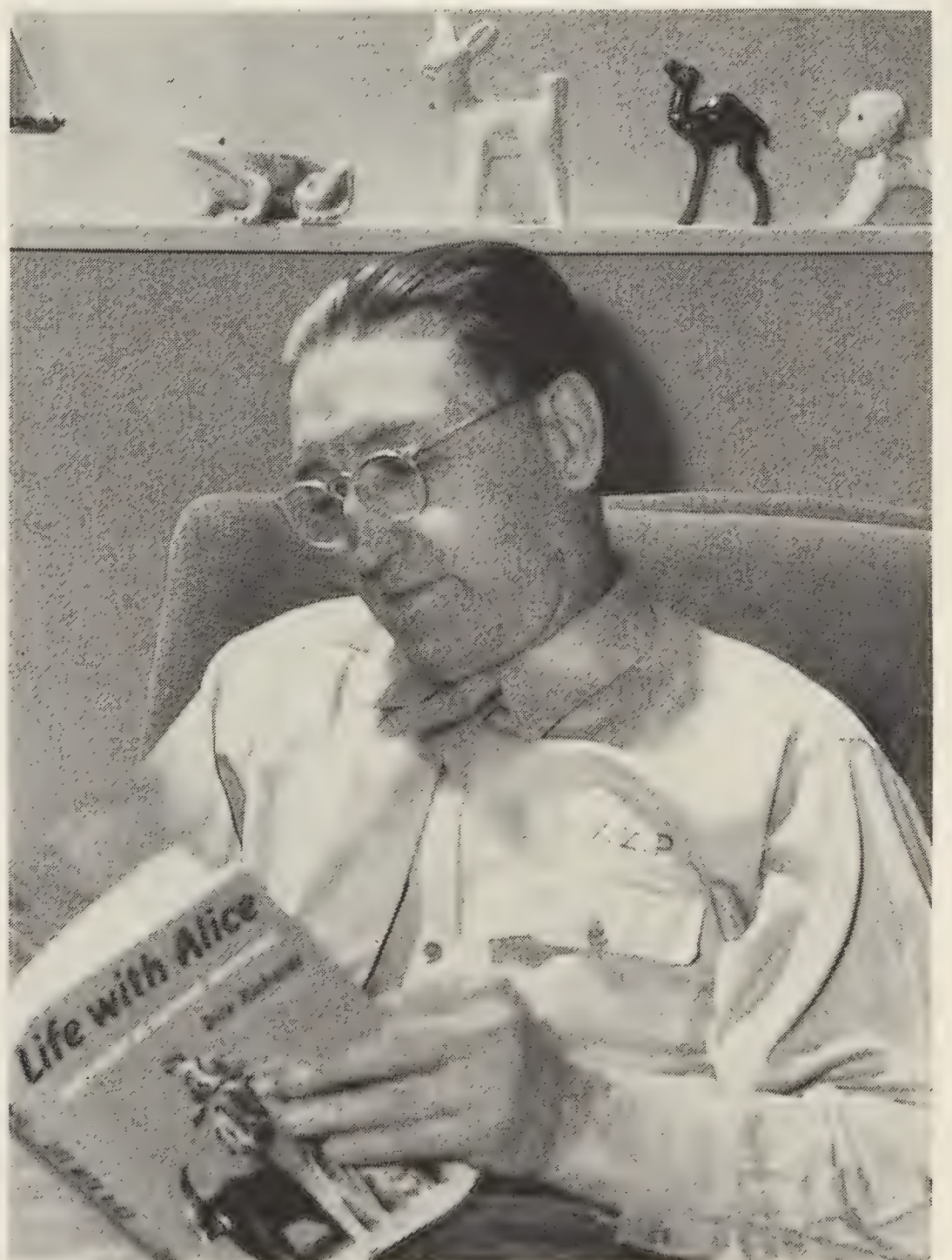
For the past two years Headkeeper Schilling has literally been on call twenty-four hours a day, for he lives in an apartment in a group of service buildings in the center of the Park. He is a man who literally lives with his work.



"GUS" EXPLAINS THE OPERATION OF A RIDING CAMEL'S SADDLE GIRTH TO HIS GRANDSON



CRATING FOR SHIPMENT IS CAREFUL WORK



DAY'S END — AND HE READS ANIMAL BOOKS!

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

With the Compliments of "Captain Bob"

Captain "Bob" Bartlett, whose death occurred on April 28, was an old and true friend of the Zoological Society and a well-loved personal friend of several members of the staff. The record of his gifts of animals to the Zoological Park goes back many years—to 1912, when he brought us five Hooded Seals as trophies of one of his cruises in the far North.

Other contributions by "Captain Bob" were: 1931, two Glaucous Gulls; 1935, a Walrus; 1939, four Muskoxen; 1940, four Walruses; 1945, a young Polar Bear.

Spring Openings

The Children's Zoo reopened for its sixth summer season on April 13, and a week later, on April 20, Question House began its second season.

Miss Corinne Johansen is again in charge of

the Children's Zoo. Under the direction of Miss Myrtice Blatchley, Associate in Charge of Educational Activities, the Question House staff includes Miss Ruth Dauchy, William Amos and Herbert Knobloch.

The Society's Technical Papers

Part 1 of ZOOLOGICA, the Society's quarterly technical journal, was published on April 29 and contained the following papers:

Notes on the Taxonomy of the Birds of Malaysia, by Jean Delacour.

A New Name for a Philippine Flowerpecker, by Ernst Mayr.

Further Notes on Display Forms of the Long-tailed Bird of Paradise, *Epimachus meyeri meyeri* Finsch, by Lee S. Crandall (Condensed in this issue of ANIMAL KINGDOM).

Field Notes on the Snakes of Kartabo, British Guiana, and Caripito, Venezuela, by William Beebe.

* * *

John Tee-Van, Executive Secretary of the Zoological Park, has been re-elected chairman of the Museums Council of New York City.

A Great Conservation Exhibit Is Being Planned

Detailed plans for a 12-acre Conservation Exhibit in the Zoological Park, the first of its kind in the world, have been announced by President Osborn following the signing by Governor Dewey of a bill authorizing construction out of State funds. The State Department of Conservation is charged with actual construction, but work will not begin until the present shortage of construction material is over.

The exhibit will occupy a hitherto unused tract in the northeast corner of the Zoological Park, adjacent to the Bronx River, and is estimated to cost \$275,000.

"We have every reason to believe that 300,000 to 500,000 persons will visit the exhibit each year and that it will show them the principles of conservation in new and striking ways, and

especially what New York State is doing for the protection of its living natural resources," Mr. Osborn said. "Forests, soils and wildlife are naturally interdependent and here in one small area we have significant facilities for showing their relationships, how these resources are being depleted and how they can be restored.

"The ways in which we expect to teach conservation lessons are largely new departures in actual demonstrations and the plans have received wide endorsement from conservation and wildlife agencies and from sportsmen. Throughout the planning we have received the finest kind of support from Commissioner Robert Moses and the members of the State-wide Conservation Council. Now the schools of the New York area will have, close at hand, an outdoor laboratory

in conservation methods and since the attendance at the Zoological Park is a pretty good cross section of American life, we expect the Conservation Exhibit not only to tell New Yorkers what their State is doing, but to give the rest of the country some important new ideas."

Visitors will enter the Conservation Exhibit through a demonstration building, the central feature of which will be a huge, segmented diorama showing a typical New York State Valley at the time of first settlement. Successive stages show the changes wrought by agriculture and the motorized life of the present day — and a projection of the future, with complete ruin of the natural resources if the present tendencies are unchecked, or restoration to something like the original form of the valley, with wise agricultural and forestry use, by means of practical conservation methods.

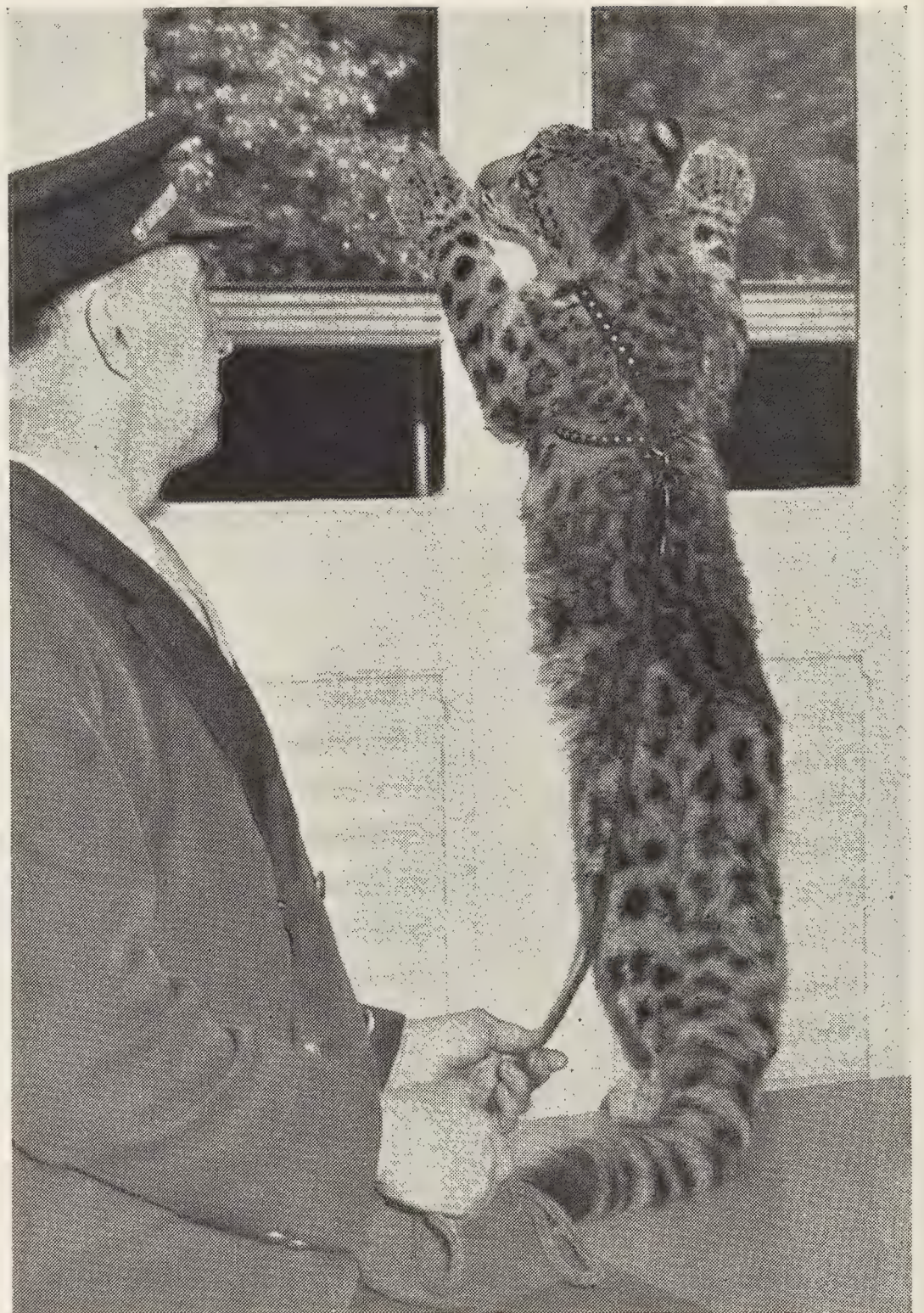
In one corner of the demonstration building we expect to maintain a model fish hatchery that will restock the streams in the exhibit and certain of the waters over the State. In summer the hatchery will be used to show mosquito control.

After leaving the Demonstration building, visitors will follow a long woodland path past an eroded hillside, a similar hillside on which erosion has been prevented by contour plowing and planting, demonstrations of bad and good forestry methods, and a series of barless, moated exhibits of New York State wildlife.

The most dramatic of these is a trout stream with an underwater window. Visitors will walk through a tunnel and look into the depths of the stream to watch the trout swimming. They will, in effect, get a trout's-eye view of the life below the surface.

A nesting bed for bass is planned, and at certain seasons they can be seen building their underwater nests and rearing their young in 4-foot concrete saucers.

White-tailed deer will roam a glade next to the river and will be confined by an almost invisible fence 30 feet offshore. There is a ready-made marsh in the area, for Beavers, and wild, broken niches for Raccoons, Woodchucks, Muskrats, Bear cubs and Skunks. Native songbirds will live in an aviary overtopping the trees. The birds will be close enough so that visitors can see them clearly and learn to identify them.



SNOW LEOPARD from western Asia, the first specimen exhibited in the Zoological Park since 1933. The two-thirds-grown animal was brought back by a soldier and is in beautiful condition.

For a Conservation Pledge

Under the sponsorship of *Outdoor Life* magazine, cash awards totalling \$5,000 are being offered for a Conservation Pledge of 30 words or less "that will inspire every American to save our natural resources." Details of the contest may be obtained from *Outdoor Life*, 353 Fourth Avenue, New York 10, N. Y.

Former Senator Frederic C. Walcott, a Trustee of the Zoological Society, is a member of the Advisory Committee for the contest.

* * *

The Zoological Society's Kodachrome motion picture on the development of a baby Gibbon was shown before the American Society of Mammalogists at Pittsburgh late in April by General Curator Lee S. Crandall. Dr. Myron Gordon, Assistant Director of the Aquarium, attended the concurrent sessions of the American Society of Ichthyologists and Herpetologists.

New Members of the Zoological Society

Members of the New York Zoological Society since the last issue of ANIMAL KINGDOM are the following:

Abbott, Cyril E.
Abraham, Miss Rae
Abrahams, Elinor Ann
Alper, Joseph M.
Arnold, Mrs. Wm. B.
Aubry, Jules W.
Austin, Mrs. Madelaine H.
Baldwin, Walter J.
Barach, Dr. Alvin L.
Binckerood, John W.
Breed, Dr. Eben
Britton, Eugene
Corning, Warren H.
Dondero, Miss Marietta
Duncan, Miss Isabelle K.
Duncan, James A., Jr.
Edgar, James A.
Eldridge, Mrs. Lewis A.
Enthoven, Dr. Emile H.
Erlanger, George

Erlanger, Michael
Forbes, John R.
Fouilhoux, Mrs. J. Andre
Frelinghuysen, Thos. T. K.
Geis, Mrs. Philip
Gerson, Sydney
Giese, George
Goddard, Miss Jessamine
Gross, Barbara
Hayes, Irene
Hein, Ann Marie
Henneman, John B.
Hocking, Dr. George M.
Hope, Mrs. John Gregory
Hugger, Miss Mary M.
Huyck, Elton Pryne
Jones, Frank N.
Keiser, Mrs. David M.
Klahr, Fred
Lehrer, Elizabeth Ann
Long, John E.

Minster, Walling
Morley, Mrs. Frederick
Muhlethaler, Dr. Paul
Page, Miss Ione
Rabenau, Herman
Randall, John
Raphael, Albert
Ritter, Elbert E.
Roth, Mrs. William P.
Schaill, William S.
Schiemann, Herbert F.
Scoville, Grace
Spurr, Joseph James, 2nd
Stern, Edgar B.
Stewart, Katharine E. T. M.
Stiger, Miss Frances A.
Stillman, C. D.
Stoutenbough, John L., Jr.
Willard, J. T.
Mlle. Ylla

Can You Spare a Camera?

Cameras of certain kinds, as everyone knows, are either hard to get or actually unobtainable nowadays except through black market sources. Staff Photographer Sam Dunton, (who is responsible for most of the photographs in ANIMAL KINGDOM and for hundreds of other pictures in the course of the year), badly needs some equipment to supplement the Zoological Society's own cameras. Consequently we are appealing to our Members, who may be able to help us out.

We would like to borrow, or buy, the following: A 2 $\frac{1}{4}$ x 2 $\frac{1}{4}$ twin lens reflex camera, such as a Rolleiflex, Rolleicord or Ciroflex, either with or without synchronized flash.

Also a good 35 mm. camera, such as Contax or Leica, complete with telephoto lens or so equipped that telephoto may be added. With or without synchronized flash.

In the event a 2 $\frac{1}{4}$ x 2 $\frac{1}{4}$ twin lens reflex simply isn't available anywhere, we could use a 2 $\frac{1}{4}$ x 4 $\frac{1}{4}$ camera with built-in range-finder, such as the Eastman Medalist.

The cameras would be used only in the Zoological Park, by our staff photographer, for routine photographic work for publications, the Education Department, and the like. Eventually,

when these cameras come back on the market, the Zoological Society expects to buy its own.

GIANTS IN ARMOR

Continued from Page 94

purpose of avoiding a tragedy of complete extinction that the New York Zoological Society dispatched an expedition under the leadership of Dr. Townsend for the purpose of rescuing a number of them from Albemarle and taking them to the mainland of the United States for establishing breeding colonies in protected areas.

This plan was not without precedent. At an earlier date the British Government had taken similar steps for the protection of Giant Tortoises native to the Aldabra Archipelago. Distributed among farmers on the adjacent islands of Seychelles, the Aldabra Tortoises were domesticated and soon multiplied to become a valuable food animal. It was hoped that similar success would crown the Galápagos enterprise.

Consequently 180 Giant Tortoises, varying in weight from five to eighteen pounds, were placed aboard the chartered U. S. Steamship *Albatross II* and taken to Balboa, whence 108 of them were sent to the New York Zoological Park. From

New York colonies of varying sizes were allocated to scientific organizations in Bermuda, Honolulu, Australia (Sydney), Arizona (Superior), Texas (Houston and San Antonio), Louisiana (New Orleans) and Florida (Miami, Brighton and Opa-Locka).

Unfortunately the admirable purpose of the project has not been fulfilled. Some of the colonies have died out or have been sent elsewhere. None of them have more than held their own. Only in Bermuda and Florida have eggs been hatched. The Bermuda baby was sent to New York when it was slightly more than two years old and weighed $4\frac{1}{2}$ ounces. Soon after arrival it died of pneumonia. The two Florida babies are still in that State, where in four years they have increased in weight from two ounces to 10 and $11\frac{1}{2}$ ounces respectively.

Previous to last April the largest colony of Giant Tortoises owned by the New York Zoological Society, consisting of forty specimens, was in the care of G. F. Sirman at the North Miami Zoo. It was he who succeeded in rearing the Florida babies. Since the colony was not breeding fast enough to maintain itself, however, and the cost to the Society was considerable, it was decided to ship a majority of the tortoises where they could be viewed by a greater number of people. This decision was reached only after it had been definitely established that, because of poaching or the presence of predatory animals, it would not be advisable to send breeding stock either to the Florida Keys or to islands off the California coast.

On April 20 the exhibit of five Galápagos and three Aldabra Tortoises already on display at the New York Zoological Park was augmented by receipt from Florida of 12 more Galápagos Tortoises. These latter are huge specimens, each weighing more than twice as much as those already on exhibition. The largest animal is 51 inches over-the-hump and weighs 330 pounds. They came by van, the floor of which was cushioned with two bales of hay. The author of this article was sent to Florida to make the transfer arrangements.

The original load consisted of 17 tortoises, but three were dropped off at the National Zoological Park in Washington and 2 at the Philadelphia Zoological Gardens. It is intended that later two

specimens will be sent to the Staten Island Zoo and four to the St. Louis Zoological Park. But meanwhile, until further distribution is made, the New York Zoological Park has one of the largest colonies of antediluvian Giant Tortoises in existence.

PUMPS ARE A PROBLEM, TOO

Continued from Page 112

"The matter" is not with us—it is with the excellent New York City water that comes rushing down underground from the up-state watershed. It is virtually free from limestone—whereas in one or two other big Aquariums, the water is heavily loaded with lime and in short order the inside of the pumps and the copper piping is literally calcified. I once cut a cross section out of a copper pipe that had been in use in a mid-western Aquarium long enough to have poisoned the whole fresh water collection—if New York City water had been flowing through it. It was a two-inch pipe, but the inside was coated with lime until the actual working diameter of the pipe was less than one inch.

Temporarily the small Aquarium in the Zoological Park's Lion House is operating on five big motor-driven pumps of hard rubber made by the Aquarium's own workmen, plus 32 small air-lift pumps that are also home-made. The largest of our present pumps carries only 50 gallons a minute; in the new Aquarium we hope to build some day, several pumps will have to carry up to 1,000 gallons a minute.

That's a lot of water, and no pump is now made that will carry it and stand up under the dissolving acids of aquarium water. But we have leaped that hurdle by setting up a whole battery of small pumps, acid-proof, that will add up to 1,000 gallons' total capacity. To borrow a phrase from the zoological world, there's more than one way to skin a cat.

* * *

An article by Staff Photographer Sam Dunton on "Flash Technic in Snake Photography" was published in the March issue of *The Journal of the Biological Photographic Association*, and was elaborately illustrated by photographs taken in the Zoological Park by Mr. Dunton.

10.673
N 57

ANIMAL KINGDOM



THE MAGAZINE OF
THE NEW YORK ZOOLOGICAL SOCIETY

NEW YORK ZOOLOGICAL SOCIETY
General Offices: 630 Fifth Avenue, New York 20, N. Y.

PRESIDENT
Fairfield Osborn

FIRST VICE-PRESIDENT
Alfred Ely

SECOND VICE-PRESIDENT
Laurance S. Rockefeller

SECRETARY
Harold J. O'Connell

TREASURER
Cornelius R. Agnew

EXECUTIVE COMMITTEE
Laurance S. Rockefeller, *Chairman*

Cornelius R. Agnew
Alfred Ely
De Forest Grant

Warren Kinney
William De Forest Manice
David H. McAlpin
Robert Moses

Harold J. O'Connell
Fairfield Osborn
J. Watson Webb

BOARD OF TRUSTEES

Class of 1947

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez

De Forest Grant
Eugene Holman
Warren Kinney

Henry R. Luce
William De Forest Manice
Harold J. O'Connell

Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1948

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely

Marshall Field
Childs Frick
Archer M. Huntington

David H. McAlpin
John H. H. Phipps

Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Class of 1949

George C. Clark
F. Trubee Davison

Jay Downer
Robert I. Gannon

Robert Gordon McKay
Fairfield Osborn

Laurance S. Rockefeller
John M. Schiff
Frederic C. Walcott

Ex-Officio, The City of New York

The Mayor, Hon. William O'Dwyer

Commissioner of Parks, Hon. Robert Moses

STAFF

GENERAL

John Tee-Van *Executive Secretary*
Jean Delacour *Technical Adviser* Herbert F. Schiemann *Comptroller*
William Bridges . . . *Editor & Curator, Publications* Sam Dunton *Photographer*
Myrtice A. Blatchley . . . *Associate in Charge, Department of Education*

ZOOLOGICAL PARK

Lee S. Crandall *General Curator*
Brayton Eddy . . . *Curator of Reptiles & Insects* Leonard J. Goss *Veterinarian*
Edward Kearney . . . *Manager, Facilities Dept.* Grace Davall . . . *Assistant to General Curator*
Quentin Melling Schubert, *Superintendent, Construction and Maintenance*
W. Reid Blair *Director Emeritus* William Beebe *Honorary Curator, Birds*

AQUARIUM

Christopher W. Coates . . *Curator and Aquarist* C. M. Breder, Jr. . *Research Associate in Ichthyology*
Ross F. Nigrelli *Pathologist* George M. Smith . *Research Associate in Pathology*
Myron Gordon *Assistant Curator* Homer W. Smith . *Research Associate in Physiology*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*

Jocelyn Crane *Research Zoologist* Henry Fleming *Entomologist*

Associates

William K. Gregory
John Tee-Van

Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

VOL. XLIX

AUGUST 9, 1946

No. 4

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York 20, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York 60, N. Y. Title registered with United States Patent Office.

Subscription, \$2.50 a year; single copy, 50 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

FOREIGN GOVERNMENTS ARE HELPING

GOVERNMENTS of countries in far-removed parts of the world are doing things of one kind or another of great help to the Society and consequently of value to the public. There have been three such instances in recent years, the last of which occurred just the other day.

It will be recalled that in 1941 the Chinese government, through the persons of Madam Chiang Kai-shek and her sister, Madam H. H. Kung, presented to the Zoological Park a pair of young Giant Pandas. These animals, of which one now survives, have in the intervening years been seen and enjoyed by actually millions of visitors.

In an entirely different quarter and of another kind of value, the government of Venezuela has been of inestimable service to the Society in making available a building, formerly the mountain retreat of General Juan Vincente Gomez, and a large surrounding area, in which our Tropical Research Station, directed by Dr. William Beebe, is now successfully established.

The most recent case of aid extended to the Society by a foreign government comes from Europe and is expressed in a letter from the Belgian Ambassador, in which he says:

"I have just been advised by the Belgian Minister of Colonies that the Governor General of the Belgian Congo would be very glad to present three young elephants to the Zoological Garden of New York. This gift would be, in itself, a recognition of the importance of this Zoological Garden and the acknowledgement of American cooperation with the Congo during the war."

Needless to say, this gift is most timely as it will provide the Park with a group of young African elephants which we hope at some early day may become established in an open moated naturalistic area in the African Plains.

It is far from easy to express the appreciation of our institution for these wonderful evidences of interest from distant countries.

Fairfield Osborn

IN THIS ISSUE

"Pop," the Hyacinthine Macaw	Sam Dunton	COVER
New Animals Are Coming to the Zoo	Lee S. Crandall	122
The Bounty System Doesn't Work	W. J. Hamilton, Jr.	130
Camera Close Ups	Brayton Eddy	139
Even the Walls Answer Questions		144
An Open Letter to Our Members	Donald T. Carlisle	146
An Artist Looks At the Zoo	Cornelia Van A. Chapin, N.A.	149
Tiny Killer	Christopher W. Coates	152
Behind the Scenes: News and Notes		154

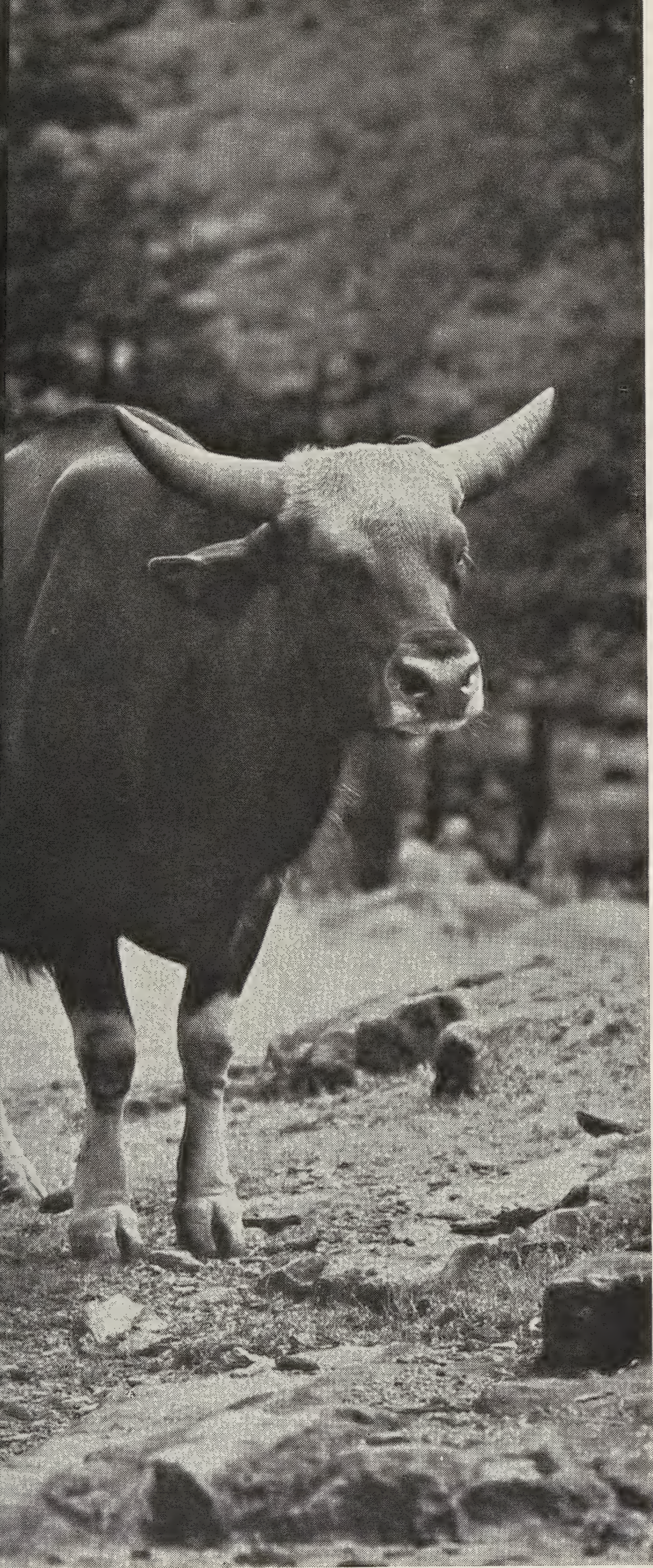


NOT ALL NEW ANIMALS COME FROM DISTANT LANDS. SOME OF THE BUFFALOES FROM NORTHEASTERN INDIA WERE BORN IN THE ZOO.

NEW ANIMALS ARE COMING TO THE ZOO

By LEE S. CRANDALL

SINCE 1939, when importations of animals were sharply curtailed, the Zoos of America have been almost entirely cut off from their normal sources of supply. Here and there, it is true, small consignments occasionally came through but these were absorbed so quickly that they left hardly a ripple.



**NO IN THE CENTER OF THIS FAMILY OF GAYALS
BY THIS SPRING, AND HER SISTER TWO YEARS AGO**

Peace came too late in the summer of 1945 to allow a revival of collecting, for winter is a dead spot, even in normal times. So we waited eagerly for spring and the bounty it must bring. Spring came, fairly enough, but the bounty was somewhat short of our expectations.

We should have known better, of course. We

knew that the great animal dealers of continental Europe would be unable to operate. We knew that local agents and collectors all over the world would have scattered and disappeared. But these factors existed after World War I and still new stocks of animals came quickly. What we had not considered was the scarcity of shipping space, the difficulty of securing food to accompany shipments and the greatly increased prices asked for the few animals obtainable in far places. Elephants in India still are barely available and are held at prices that would make them sell here at twice the normal \$2,000. American soldiers, on remote posts, have sought relief from boredom by buying such young or tame animals as they could find, at outrageous prices. One Hundred Dollars each, paid for Leopard or Bear cubs, worth perhaps Ten or Fifteen Dollars, makes an awkward precedent when a price-wise dealer comes along.

In spite of all, animals have come to America and many more will follow. Prices are approximately double pre-war standards and while first arrivals were eagerly snapped up, a growing wall of resistance is rapidly being erected. It is a difficult time for the importers, who must realize on greatly increased costs in the face of the indignation of their patrons.

From such shipments as have come, we have had perhaps a little more than our share, since we occupy a fortunate strategic position in the principal port of entry. We have been able to chortle happily over new Tayras, Grisons, Giant Anteaters and Two-toed Sloths, the first of their respective species to be seen here in years. Our aquatic bird collections have been enriched with White Storks, Black-necked Storks, Maguari Storks and Jabirus. Banded Kraits, Indian Cobras and Russell's Vipers have greatly enlivened the already excellent exhibits in the Reptile House. We are delighted with them, as well as the anticipated arrival of Giraffes and riding Dromedaries. But we are still staggering slightly from the impact of costs.

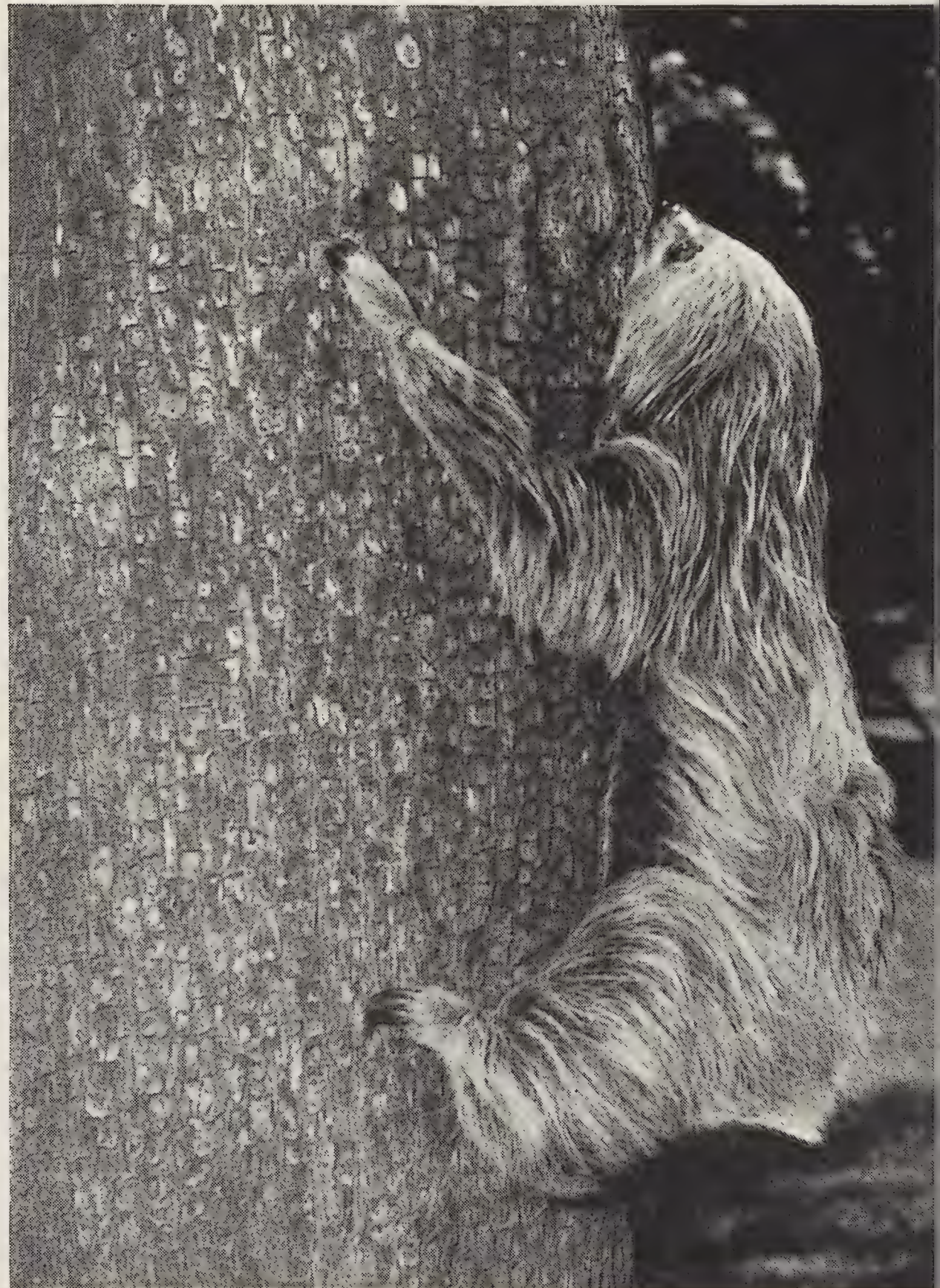
However, the somewhat gloomy picture is not without its subdued sunbursts. American zoos, thrown on their own resources for so many years, have devoted themselves to intensified efforts at reproduction among the animals on hand. This aim has been aided by greater available space, usually occupied by specimens that came and



RESTORED ANIMAL SHIPMENTS FROM SOUTH AMERICA BROUGHT THIS TWO-TOED SLOTH. ON THE GROUND IT APPEARS AWKWARD AND CLUMSY. NEVERTHELESS IT SCRAMBLES AT SURPRISING SPEED.

HOOK-LIKE CLAWS (THREE ON HIND FEET, TWO ON FRONT) ENABLE IT TO HANG SUSPENDED.

EVEN A LARGE TREE WITH COMPARATIVELY SMOOTH BARK CAN BE CLIMBED WITH EASE.





NORMAL TRAVELING POSITION of the Two-toed Sloth is like this. To obtain the photographs on this and the opposite page, the Sloth was allowed the freedom of a low-branched tree in the Zoological Park. It soon developed that the top-most branches had an irresistible appeal for the Sloth, and it was only by cutting away any twigs of higher branches that came close to this dead limb that the slow-moving but persistent animal was induced to stay within range of the camera — and of the keepers.

went too readily when replacements were easily obtained. Breeding stocks of mammals and birds of many kinds have been established and there is no reason why this practice should not be continued, since such specimens can be produced at

costs far under those of imported animals.

Also, it appears that rarities may be obtained much more economically under our own auspices. Direct action in this field will be well under way before the year is out.

All the photographs accompanying this article are the work of Staff Photographer Sam Dunton.



SOUTH AMERICA contributed a weasel-like creature known as the Tayra, an animal regularly seen in the Zoological Park in pre-war days. Normally it is largely a night-hunting animal, searching for small rodents and birds — or even raiding poultry houses in the villages. It climbs with astonishing agility.



GREAT RARITY is the "blue" bear in the center of this picture. The three cubs were presented to the Zoo by the New York State Department of Conservation. See the note about the "blue" Black Bear on p. 154, by Mr. Crandall.



BABY SCORPIONS were hatched in the Zoological Park and, in accordance with Scorpion habits, spend the early part of their lives on their mother's back. The female Scorpion came to the Zoo from Florida this spring.



THE GRISON is another member of the weasel family of South America, and is a relative of the Tayra. In general it is an inhabitant of open country and — where it is common — is destructive around native poultry yards.



▲ **HOUSE GECKO** is a familiar inhabitant of the Asiatic region. This specimen came to the Zoological Park in a recent important shipment from India — the first such shipment since the end of the war restored contacts.

◀ **ON GLASS** the Gecko is able to walk with perfect ease, even on a vertical surface. This it does by means of the adhesive pads on its toes. The photograph was taken looking through a sheet of plate glass in our studio.



▲ **DEADLY** but beautiful is the Banded Krait of the Malaysian region, another recent importation. Its colors are black and yellow. It is a sluggish snake, but when it bites it holds on with determination.

RUSSELL'S VIPER is also ► known as the Tic-Polonga. This is the snake that plays such an important part in the Sherlock Holmes story, "The Adventure of the Speckled Band." It lives throughout tropical Asia and Malaysia.



The Bounty System Doesn't Work

By W. J. HAMILTON, JR.
Cornell University

THE PAYMENT of a bounty on wild animals in the United States has extended over more than three centuries, certainly long enough to test its merits or shortcomings. Every state in the union has learned, at its own expense, the limitations of this method at a prohibitive cost.

Massachusetts first provided rewards for the destruction of wild animals in 1632. In early colonial days the bounty was confined primarily to wolves, in Virginia the reward being in the nature of tobacco which was the medium of exchange. In the seventeenth century South Carolina offered a bounty on rice birds (bobolinks). The history of the bounty system does not concern us here¹—suffice it to say that by 1895 laws providing bounties on wild animals were in force in about thirty states of the Union!

A renewed interest in the bounty system of controlling supposedly noxious animals has revived the age-old questions: "Is the bounty desirable?" "Does it accomplish the purpose for which it is designed?" Hunters and many agriculturists believe it will result in a reduction of undesirable wildlife. Advocates of the bounty system appear to think that almost any species can be materially reduced in a short time if premiums on their scalps are sufficiently high. Control, for the most part, is not a question of months, but of many years. It has been proved repeatedly that such control of any species can be accomplished rapidly only under extraordinary conditions. Theoretically, a bounty *must* be high enough to insure the destruction of at least a majority of the individuals during the first bounty season. It has been repeatedly demonstrated that not a single state has been able to maintain a high rate for more than a few months, and it is evident that the higher

Putting a price on predators has been tried for centuries, but it never works. Here are reasons why—and some concrete proposals.

the rate, the greater the danger of fraud. Virginia encouraged the killing of wolves almost from the first settlement of the colony, and has at times paid \$25 apiece for their scalps, but wolves were not exterminated until the Civil War period, or until the rewards had been in force for more than two centuries—and even then not because of the bounty but rather through the settlement of the state.

After paying a substantial bounty on bears for many years, the state treasurer of New Hampshire, in 1894, called quits. In exasperation, he said that if the various counties continued to be successful in breeding bears for the bounty, in proportion to their tax levy, it would require a state levy of nearly two million dollars to pay the claims. Similarly, New York had a bounty on bears, but withdrew it half a century ago, not because such a bounty had become unnecessary, but because the number of animals killed increased steadily each year.

It is not the purpose of this report to suggest the value of predatory animals; that has been discussed elsewhere.² But in passing it must be stated that the interrelationships of animals, one to another, are but little understood by the layman, and not a great deal more by the investigator who spends countless hours attempting to fathom these mysteries. An example or two will illustrate this point.

More than half a century ago, Kansas provided for a \$2 bounty on coyotes and a 5¢

¹ Palmer, T. S. 1896. Yearbook U. S. Dept. Agric., p. 59.

² N. Y. Zoo. Soc. Bull., vol. XI, no. 2, 1937.



Photo by W. J. Hamilton, Jr.

WHO IS TO JUDGE? The Long-eared Owl is a useful bird of prey, feeding principally on mice. Some states pay a bounty on the Great-horned Owl. What county officials can differentiate between the two? Those who pay bounties are not elected to office because of their knowledge of ornithology. . . . Incidentally, Dr. Hamilton reports an interesting story behind this photograph of the Long-eared Owl. He had the good fortune to find the nest, in a bog near McLean, N. Y., during his senior year in Cornell University. "Studies were neglected and all other matters took on a lesser importance as my companion and I made repeated trips to photograph and observe the owls. Often the incubating bird showed little concern as I climbed to the near-by blind. Occasionally she would fly off into the near-by hemlocks and commence a call which sounded for all the world like the muffled barking of a small dog. When the nestlings were small, my approach elicited a very different response. Throwing herself from the nest onto the ground, she would thrash about among the cinnamon ferns and swamp litter, feigning a broken wing in an attempt to lead me off. At such times a great variety of notes were uttered, some similar to the squealing of a trapped rat and the caterwauling incident to a good cat fight. Only then would her mate appear, to fly with great ado, his snapping bill and excited swoops showing his real concern. But once in the blind and hidden from view, my presence no longer disturbed the pair, and the female would soon return to brood her young."

bounty on rabbits. As a result, the coyotes, natural predators of the rabbits, so decreased that the rabbits had their way — the bounty failed to reduce this accomplished competitor for cattle range.³

Many other states have provided multiple bounties for mammals, often including in their list coyotes and ground squirrels. Some years ago a survey of the sage grouse was undertaken in Utah. It was noted that ground squirrels were preying on these birds, in one instance leaving only three or four chicks from a covey of fourteen.⁴ We might surmise from this that coyotes, which prey far more heavily on ground squirrels than upon birds, might have a salutary effect on game birds. If coyotes are reduced too drastically, the ground squirrels increase, preying more heavily on the birds. One bounty might conceivably defeat the purpose of the other.

Each state has jurisdiction over its noxious animals, and accordingly makes its own laws. Counties within the state may appropriate money for bounties to be paid on wild animals. Some



FOXES that are trapped for sport and fur value primarily also pay the hunter a bounty dividend. Actually they would have been caught anyway.

states rely on the state bounty (Pennsylvania), some on the county (New York) while not a few are maintained at the expense of township treasuries. Indeed, some states rely on all three. Since a state bounty is shared equally by all taxpayers, while the benefit is conferred on a small proportion of these, a few western states have

³ Lucas, Rept. U. S. Nat. Mus. for 1889, p. 612.

⁴ Utah Agr. Exp. Sta. Misc. Publ. 10, 1933.

insisted that a special tax be levied on the assessed value of all horses, cattle and sheep, in addition to the regular proportion of taxes set aside as a state bounty fund.

During the past two years, foxes have increased greatly in New York State. A decade ago one might have passed a year afield without seeing a fox; at the present time it is not uncommon to see at least one reynard on every trip afield. At the same time foxes were increasing, inclement weather during the breeding season, combined with other factors, materially reduced the pheasant population. Putting two and two together, the hunter assumed that foxes were responsible for the decline in his favorite game species. Such specious thinking brought belated county bounties on the fox in several counties of New York. Neither the low bounty nor the price of fox pelts, at \$3 each, was sufficient to induce anyone to make a determined effort to trap or hunt foxes. *But*, the state has many trappers who ply their trade in late October and early November, before freezes occur, at a time when foxes are most easily taken. These individuals trap because they like to; they gain the same satisfaction of outwitting a red fox as the hunter does in bagging a buck or the fisherman in landing a handsome trout. Yet, for the most part, these foxes are trapped before a bounty is authorized. In the bounty period, the foxes that were trapped for sport and their fur value are probated for bounty. *These animals would have been taken had no bounty been offered.*

Effect on the Species

A bounty must be high enough to secure extermination or a vastly reduced population. Such a fee would be prohibitive because of the cost. No state can possibly withstand the financial strain for the length of time necessary to control or materially reduce the species in question. Conversely, a low bounty means that the animals will be trapped or shot only so long as their numbers make it profitable, after which they will be left alone, again to increase.

Does the stimulus of a bounty materially reduce a species? In forty-nine years Minnesota has paid \$1,243,165.53 in wolf bounties and the annual expenditure showed a gradual increase



Photo Buffalo Courier-Express

TIMBER WOLF population of Ontario seems to have increased since a bounty was instituted in 1929. Deer have increased during the same period. Obviously, control of predators is not the sole and simple answer to game management problems.

since 1903.⁵ One might well ask if it is worth while.

Timber wolves and coyotes are common in Ontario. Coyotes have increased rapidly in recent times and appear to exhibit regular fluctuation in numbers. During the period 1929-39 some 33,000 wolves were probated for bounty at a cost of half a million dollars. There is no evidence of any reduction in the timber wolf population

⁵ Jour. Mammalogy, 1928, p. 89.

and the coyotes (brush wolves) have increased. The total wolf population appears to be actually greater at the present time than it was in 1929 despite the bounties paid. The effect appears to have been to kill off the surplus, thus making things easier for the survivors. Had no bounties been paid during the period, it appears quite probable there would have been no material difference in the wolf population at the present time. The premise on which bounties are paid is that if there were fewer predators, there would be more game. However, deer greatly increased in numbers and in range in Ontario at the same time that wolves were increasing. The number of game animals, and for that matter, all species, is controlled by a number of factors, some of which are very complex, and predatory animals are but one of them. If the money spent on wolf control had been used to find out what Ontario's resources need, it would return dividends rather than deficits.⁶

Who Collects the Bounty?

Every farmer, rancher or orchardist will attempt to eliminate animals which destroy his poultry, sheep or fruit trees. A bounty does little to add incentive to the control of pests. In general, by far the greater number of individuals who honestly probate animals for bounty are those who have suffered material damage at the hands of these species. Those who collect bounties on coyotes are usually ranchers who suffer from livestock losses; these very ranch owners would do all in their power to minimize temporary loss to their sheep, cattle or poultry without a bounty.

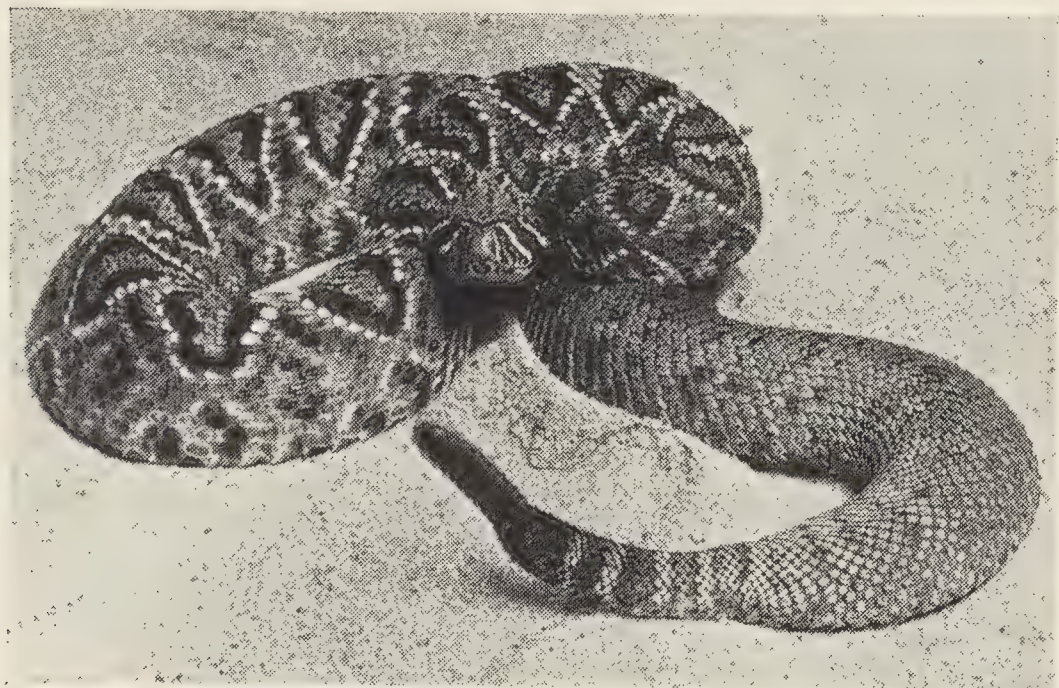
Thirty years ago a Des Moines, Iowa, paper reported that nearly 4,000 pocket gophers had been presented to the Polk County auditor for bounty in a period of ten days. Since the farm lads must trap the gophers anyhow, and the county is prepared to pay, why not collect the bounty?

Boards of Supervisors, sheriffs and their deputies, county clerks and others who pass judgment on bountied species, are not elected to their respective offices because of their knowledge of natural history! This is no reflection on the

⁶ Rod and Gun in Canada, Jan., 1937.

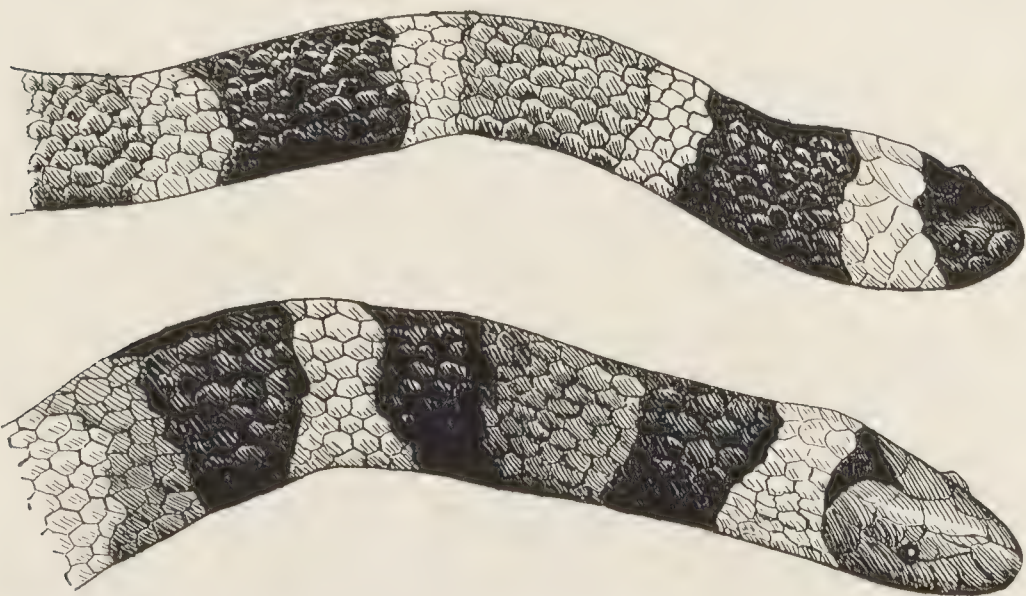
integrity of these officials, but unfortunately they are often ill-advised, and, as in all trades, they are beset with troubles of their own. Why not pass a fox off as a wolf, if there be a question in their minds? And those who probate pelts for bounty are often insistent and irate if their determination of a species proves wrong.

Poisonous snakes, or for that matter, any snake, do not delight the tourist unless they are in a pit next to a roadside gas station. In 1938 Pinellas County, Florida, offered a bounty of \$1



BOUNTY on Florida Rattlesnakes at \$1 a head is hard to understand, for most persons kill poisonous snakes anyway, without the incentive of a bounty — or else avoid them whenever possible.

for rattlesnakes and twice that amount for coral snakes. Just why a bounty on poisonous snakes is necessary is hard to understand. Those who have little fear of a poisonous reptile would never miss the opportunity to kill one, bounty or no bounty. I have hunted snakes through the Florida peninsula on many occasions, and record it as a red-letter day in my field notes when I

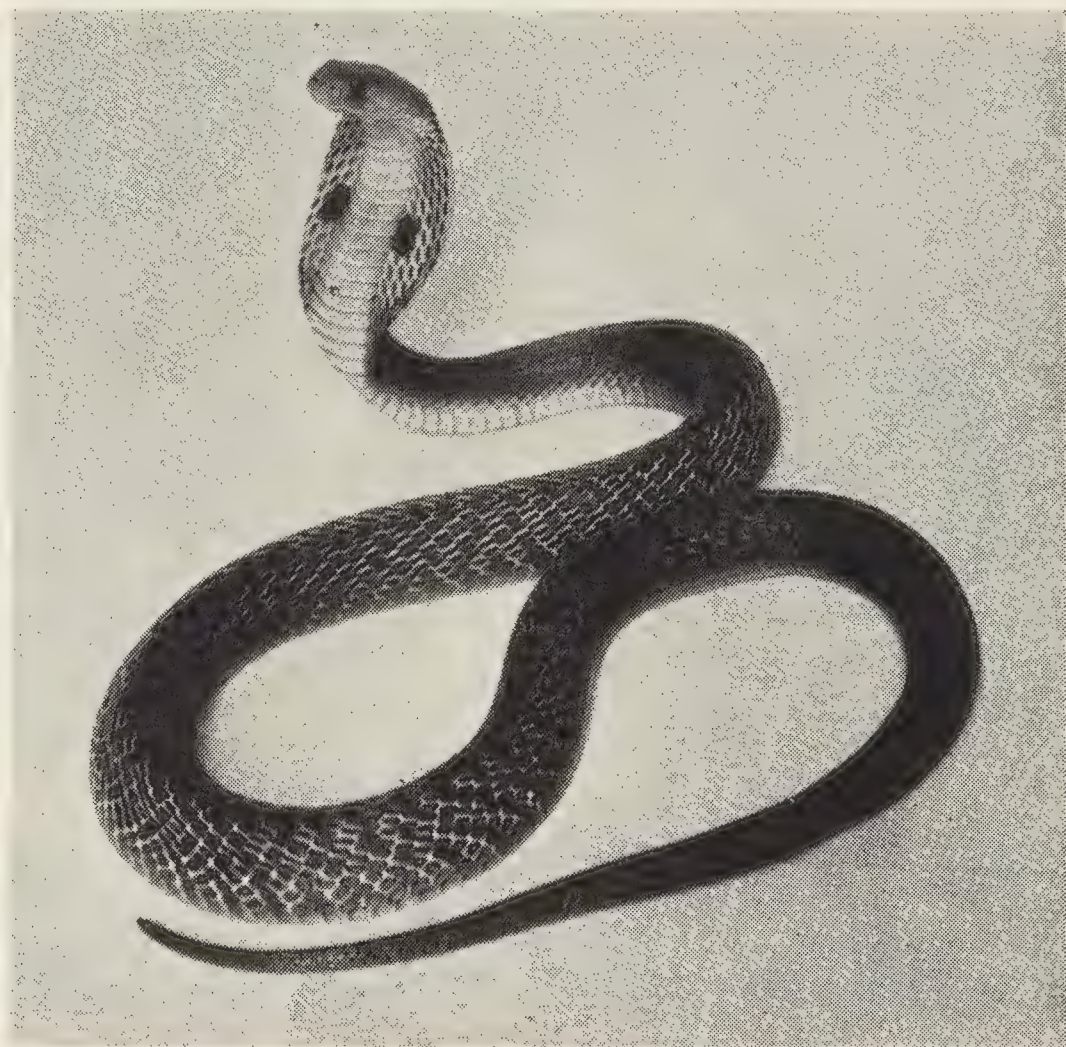


ERROR is all too likely to creep into the payment of bounty on the poisonous Coral Snake (top) and the harmless Scarlet King Snake (bottom). It takes experience to distinguish them readily.

am so fortunate as to turn up a coral snake. Those who do not like snakes destroy them with the slightest provocation, but few there are who feel they can afford to squander their time in search of these venomous reptiles. Moreover, once the snake is slaughtered, who is to judge what species it is? What layman, charged with the payment of the bounty, can discern between a scarlet king snake and the poisonous coral? I have studied snakes for years, yet before reaching down for a coral, I always try to remember the slight difference in the similar color pattern of the two.

Bounty Frauds

A monetary reward for the destruction of a supposedly noxious animal lends ample opportunity for fraud. Those entrusted with the payment of a bounty fee on receipt of the skin have little knowledge of natural history, and,



COBRAS became overly abundant in India several years ago, so a bounty was established. Consequently it became a profitable business to collect the eggs and raise Cobras for the "bounty market."

as a matter of fact, care little about the subject. Examples of fraudulent practice are legion; a few instances will suffice.

Some years ago, cobras became too abundant in India, so officials offered a bounty on the snake. The natives dug up the nests, incubated the eggs in regular hotbeds and successfully

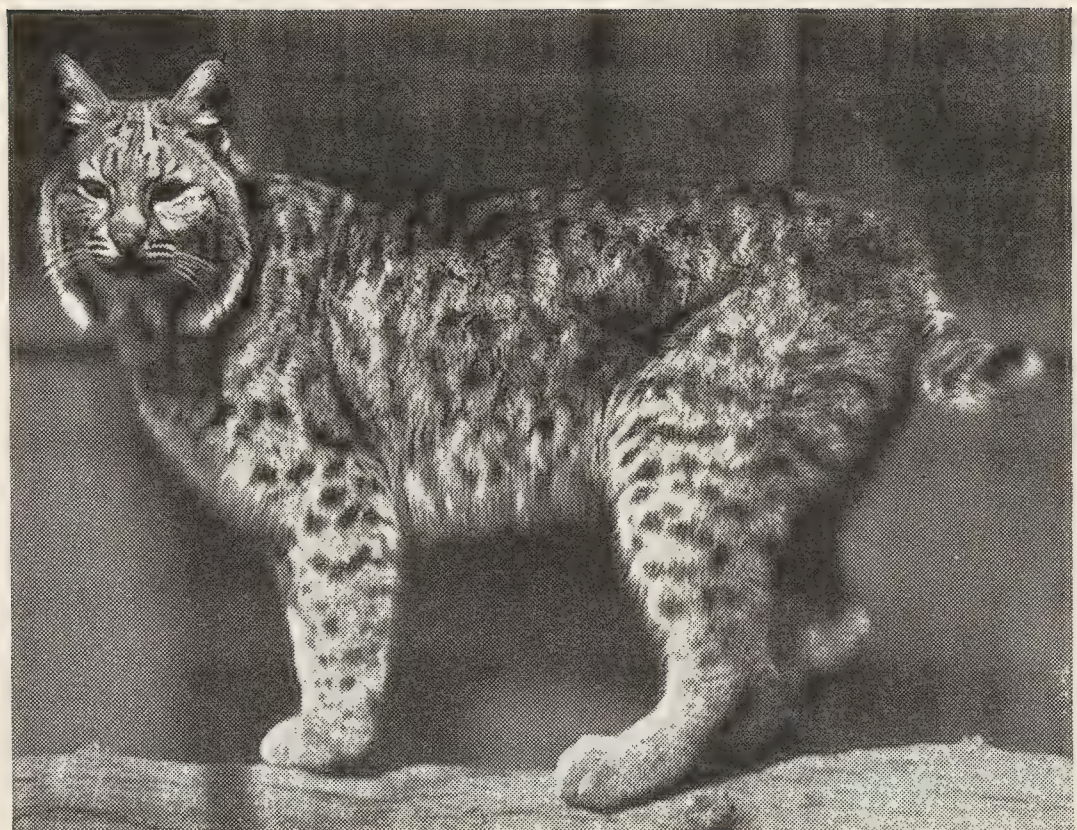
raised the young that they might collect bounties on the snakes. Had the eggs been left alone, many would have been destroyed by their natural enemies which abound in the East Indian jungles. Adders became too numerous in France, but when a bounty was placed on them, incredible numbers were turned in. It later developed that the snakes were being imported.⁷ Coming closer to home, we can cite many instances of a similar nature. At one time a North Dakota county paid considerable sums for certain species of ground squirrels, first required the heads, later the tails, a year or two afterward all four feet! What county official can determine specific differences between the feet of ground squirrels? Over the years, counties in mid-western states have paid bounties on ground squirrels, which pilfer some grain. Usually the tail only must be presented when the bounty is claimed. A student once told me that the pregnant females are trapped alive in the spring, the tail cut off and the animal released. The female is in no way

⁷ Barbour, 1926. Reptiles and Amphibia, p. 26.



Photo F. Q. Bunch

COYOTE TRAPPING during the pupping season led to serious frauds. One man sent in 560 pelts of pups at \$2 each—but a careful examination revealed that they were the tanned skins of gophers.



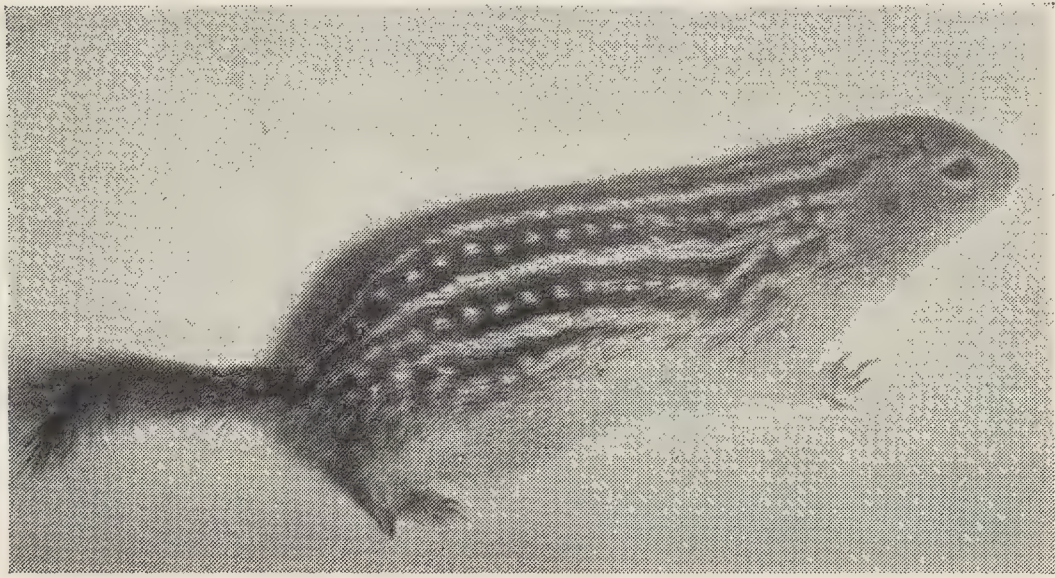
BOBCAT bounties of \$5 made it profitable for one hunter to present the feet of small Ocelots and of little southwestern wildcats, taken hundreds of miles away from the bounty-paying State.

impaired from raising her family and thus producing another litter of tailed young ones for the trappers to operate upon. Some unscrupulous trappers even split the tail lengthwise with a razor blade, thus doubling their stakes at the moment the former owner was nursing a litter of young squirrels.

The lack of uniform bounties on predators destroys the purpose for which it was designed. Witness the case of Montana. In 1936, bounties were paid on 14,000 coyotes at \$2 apiece. Since the Fish and Game Commission had taken it over, the system seemed foolproof. Bounties were paid during May and June during the pupping season. It was found that the heaviest bounties were paid in the counties adjacent to the Canadian line and also bordering the states which have no bounties, indicating that Montana was paying bounties on animals taken from other states and Canada. In 1937 an investigation was started and it was found that one man sent in 560 coyote pups. All of these were skinned, and the pelt was tanned. Critical examination of these pelts revealed them to be gophers. Incidental to this, the Montana Game Commission was paying \$25 on mountain lions taken at any time of the year. The Idaho game officials were advised that Montana was paying bounties on Idaho lions. Idaho then put a bounty of \$100 on the mountain lion and during the period of this high reward, very few lions were probated

for bounty in Montana, but the lion population in Idaho *increased notably*. Idaho officials then suggested that they were paying for Montana cougars!

In central Washington during 1925, an investigation disclosed that wildcat skins were being shipped in from Mexico to Texas and then to Washington and British Columbia. The bounty was paid by a girl in the auditor's office who



FAMILIAR to rural folk in the prairie states is the Striped Gopher. Auto traffic takes heavy toll and gopher casualties along the highway offer an opportunity for fraudulent bounty claims.

didn't care whether it was a wild cat or a house cat. Some hunters were paid as high as five or six thousand dollars.⁸

Occasionally fraudulent claims are discovered. In a certain western state \$5 is allowed on a bobcat and \$1 on a coyote when the pelts are presented to the proper county official. This individual removes the right front foot of the pelt when the claim is paid. The claimant is permitted to retain the skin. An auditor asked a federal hunter how many bobcats he usually caught in a single season. The hunter replied that ordinarily he did not take more than four or five in three seasons. The auditor, somewhat astonished, intimated that perhaps the federal hunter was not fully acquainted with local conditions because that day a man had presented for bounty 34 bobcats, declaring on affidavit that he had caught them in the immediate vicinity within a period of thirty days. The matter was reported to the sheriff, who apprehended the man. It was found that this individual had collected \$652 in bounties on 129 bobcats and 7 coyotes and also that most of the skins presented as bobcats were of

⁸ MacDonald, 1937. California Fish and Game, p. 66.

small ocelots, animals totally foreign to that state, and also of little southwestern wildcats, taken hundreds of miles from the boundaries of the state.

Not long after this incident another bounty hunter entered the state and proceeded to present for bounty 35 bobcats in one county, 48 in another, 30 in another, and 40 in still another. Investigation by the county officials, whose suspicions were thus aroused, led to the man's arrest. In his car were 75 bobcats and a sack containing 356 extra bobcat feet. Close examination showed that the feet had been sewn onto some of the skins. This man recently had strongly condemned, to the county game officials, the federal paid hunter method of predatory animal control.⁹

These are particularly pernicious examples, but fraud flourishes so long as the bounty system exists. Who can differentiate a fox pelt from county to county, let alone the difference found among pelts taken in adjoining states? Yet one county may offer a bounty of \$5 for a red fox, an adjoining county pay \$3, while one which



WOLF BOUNTIES cost Minnesota heavily. At \$15 a head on a grown wolf and half as much on a cub, there was an irresistible temptation to certify foxes (and possibly dogs) as wolves.

borders both pays no bounty. The answer is obvious.

For years Minnesota has paid bounties to get rid of wolves. But it appears that wolves are

⁹ Bird Lore, Vol. 32, p. 247.

increasing, or else the bounty claimants are "foxing" the state. In 1938, the Conservation Commission studied the books only to find that during 1932-33 the state paid out \$14,335 for wolf bounties. During 1935-36 the payments increased to \$40,509. During the interim, a decided increase in the sport of fox hunting was evident. At \$15 bounty on a grown wolf and half as much on a cub, the temptation appears irresistible for county auditors to certify foxes (and possibly dogs) as wolves. At the time, an investigation was under way into charges that at least four men had done quite well collecting bounties on foxes disguised as wolves. That auditors or their assistants cannot recognize a wolf pelt from that of a fox is lamentable, but such individuals are liable to charges of malfeasance if they certify wrongly.

In the '90s, Pennsylvania offered a bounty on hawks and owls. Dr. B. H. Warren, then State Zoologist, who had made a careful study of the "scalp" act, stated that the heads of domesticated fowls, partridges, pheasants, cuckoos, butcher birds and even the useful and inoffensive night-hawk were accepted in some counties as those of hawks and owls. The fact remains that those charged with passing judgment on the animals probated for bounty do not ordinarily distinguish one species from another. Rather than show their ignorance, they pay the fee.

Judgment of the Bounty

Those who are charged with game restoration and are in a position to see the overall picture with unbiased mind should be heard.

Professor Charles O. Handley, who is charged with directing much of the game research investigations in Virginia, has the following to say:

"The expenditures in Virginia of \$340,325 for the taking of 695,653 hawks, owls and crows over a six year period 1924-29 may have saved some quail, but I am of the opinion that had the same amount of money been spent on les-pedeza seed for distribution much would have been accomplished."

L. B. Nagler, Assistant Secretary of State, Wisconsin, states:¹⁰

"I have had ten years' experience in auditing

¹⁰ Fins, Feathers and Fur. June 1917, p. 1.

bounty claims, and the results convince me that the system in vogue is not only ineffective, but wasteful and in a long measure, harmful."

There is little need, nor does space permit, the laments of those who have been charged with the administration of the bounty system. It is an almost universal opinion among such administrators of wildlife that the bounty system is not only vastly expensive and productive of

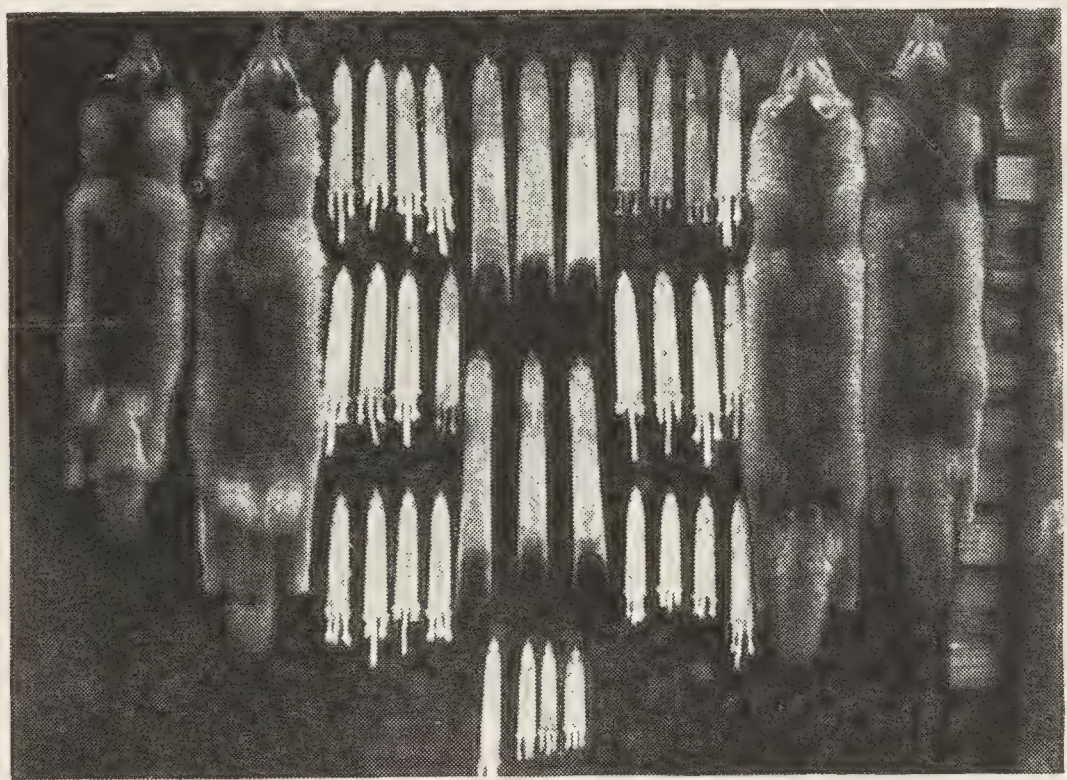


Photo by W. J. Hamilton, Jr.

ONE SUBSTITUTE for the bounty system is control of pests by the individual suffering losses. Many farm boys can be educated in the technique of trapping and they do a good, profitable job.

almost endless fraud, but it likewise fails completely of accomplishing the end desired.

Pennsylvania paid, over a period of two decades, more than two million dollars on bounties, amounting to 13 per cent. of the Game Commission's operating funds. Two-thirds of the money was spent on the weasel, yet the bounty system has not, to any noticeable extent, appreciably reduced the weasel. In summary, the system would seem to indicate that as a predator control measure, the payment of bounties has proved generally inefficient as it has placed under control only one relatively small species population (wildcat), while its effect on five others has been negligible. Let us not forget that bounty payments were on *all* weasels, including the diminutive least weasel, that weighs scarcely more than an ounce, and would have difficulty overcoming a chipmunk. Gerstell,¹¹ who analyzed the effects of the operation of the Pennsylvania bounty system in detail, has

¹¹ Research Bull. No. 1, Bd. of Game Comm., Penn., 1937.

shown that as a predator control measure the payment of bounties has proved grossly inefficient. He demonstrated that it has been impossible to prove that the operation of the bounty system over a relatively long period of years has improved game conditions. Gerstell indicates that the amount of money annually expended for bounty payments was controlled, not by the abundance of predators, but principally by climatic and general economic conditions.

Alternatives to the Bounty

The old axiom "A penny saved is a penny earned" applies to the bounty system. But if we discontinue the payment of bounties, what else? In early days, scalps of destructive animals were received in lieu of taxes; planters were required to kill so many pests or else pay a fine. My home town, well over a century ago, commanded men to hunt foxes and wolves, where now I still enjoy the pleasures of a fox hunt. But let us not concern ourselves with the past. Immediate substitutes for the bounty system are needed. How to accomplish these?

The suggestions are listed:

1. Control of pests by the individual rather than by the lavish expenditure of state and county funds, which seldom, if ever, gain the desired end.

2. Instruction in control methods to the individual, particularly those suffering losses, by state and federal trappers. As an example, let me cite one instance. Convinced that one of the most successful ways of controlling the coyote is to educate the farm lad in the technique of trapping this valuable fur animal, the South Dakota Game and Fish Commission employed three expert trappers, each of whom was assigned to an area where coyotes were most numerous. During the trapping season these trapper wardens covered their respective districts, instructing and working a few days with any farm boy who wished to learn trapping. During this time scores of farmer boys received instructions, and in every instance, they have made good to the extent that not only have they kept the animals under control in their home areas, but many are following coyote trapping as a profession and have cleaned up areas adjacent to their

homes. A 17-year-old farm lad caught 85 coyotes by trapping during the season when the pelts were prime. A 15-year-old boy trapped 26 coyotes in 14 months.¹²

After an unprecedented increase in foxes in 1945, with much resultant damage to poultry, the New York Conservation Department has sent a man into the field instructing farm boys how to trap foxes, and the results and enthusiasm of the young trappers are already evident. The Conservation Department rightly frowns on the bounty system, and has done all in its power to show the individual county supervisors, against their specious arguments, the fallacy of paying such claims.

3. Den hunting by federal hunters. If the bounty were abolished, none would be concerned in the taking of injurious animals other than federal hunters, trappers (who take animals only when their pelts are prime) and ranchers and farmers who suffer obvious loss. The latter would take remedial measures at once, bounty or no bounty. Federal hunters, knowing the ways of the larger predators, can find the dens in the early spring and destroy parent and young, if these have proved destructive and need control.

4. State hunters have paid their way in controlling the larger predators. California paid a bounty on mountain lions for many years but finally employed a state lion hunter to keep these big cats from becoming too abundant. All accounts indicate that the state-hunter system is more desirable than the bounty.

In concluding, we should like to leave one point, an important one, with the reader. It is now generally recognized among biologists that there exists an annual surplus of practically every species of animal. The environment can withstand just so many of each species in a given ecological niche. Whether this surplus is to be destroyed by predation, climatic conditions, disease, lawful hunting or even by bounties, it must go. All species are subjected to natural checks, otherwise they would populate the earth. Their numbers are regulated over the years, not by a bounty, but in spite of it. Let all who would consider a bounty in the future pay due regard to the lessons of the past.

¹² Johnson, 1935, *Hunter Trader Trapper*, Sept., p. 39.

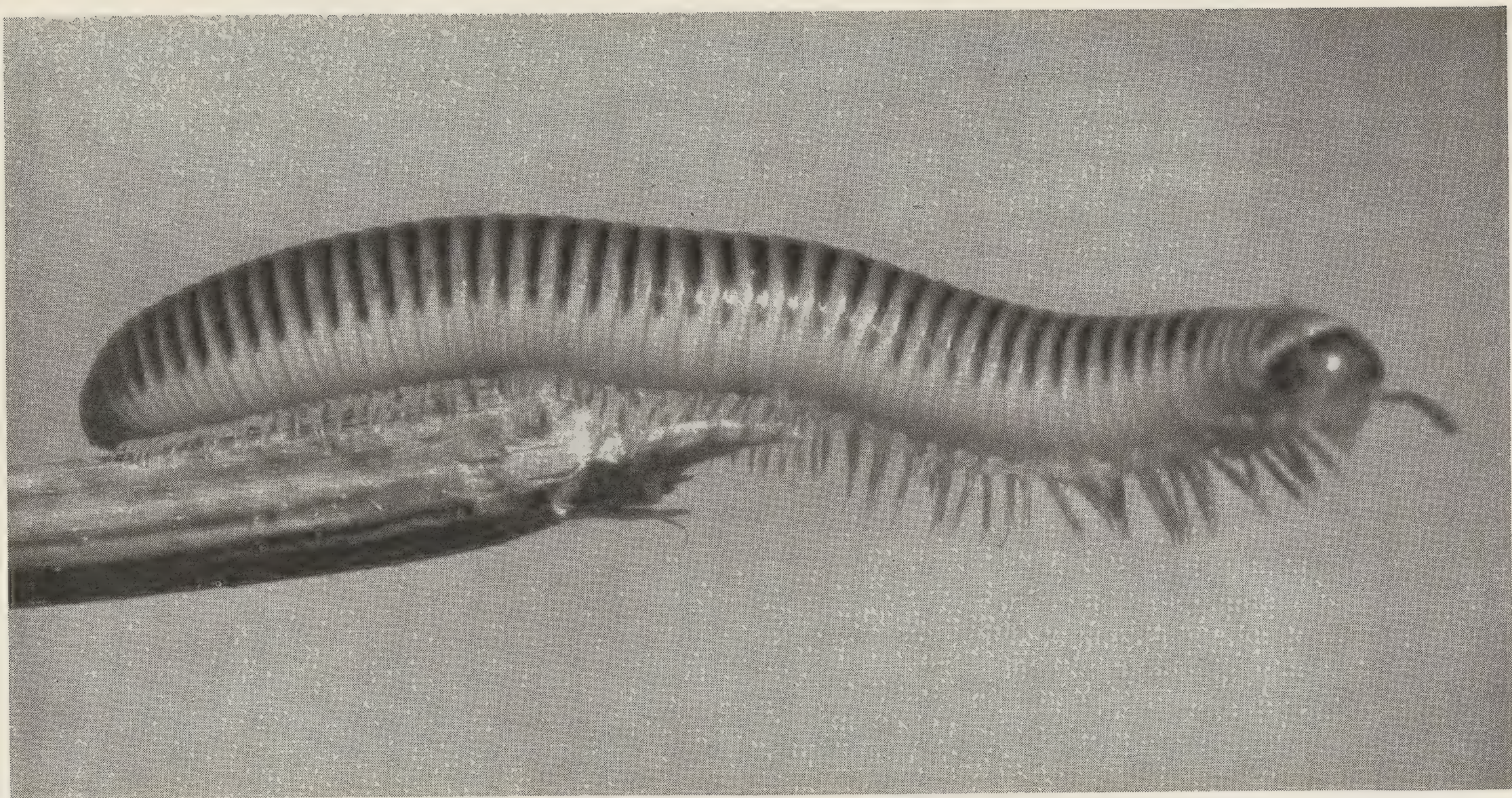


Photo by Jack Layer—Journal-American

INSTEAD OF SPIRALLING LIKE A SLUG, THE MILLIPEDE RUNS ALONG THE TOP OF A TWIG TO ESCAPE THE LIGHT. PHOTOGRAPHY WOULD BE EASIER IF IT WOULD STAND STILL WHEN IT REACHES THE TOP!

CAMERA CLOSE UPS

By BRAYTON EDDY

ONCE A WEEK for several months the Reptile House office in the Zoological Park has become a photographic studio where a variety of creatures, from minute, quarter-inch-long insects to Yellow Monitor, have posed before the special cameras of Jack Layer, staff photographer of the New York Journal-American. Subsequently the pictures appeared, often in half- or-quarter-page "blow-ups," in that newspaper, and some of them are reproduced here through the courtesy of Mr.

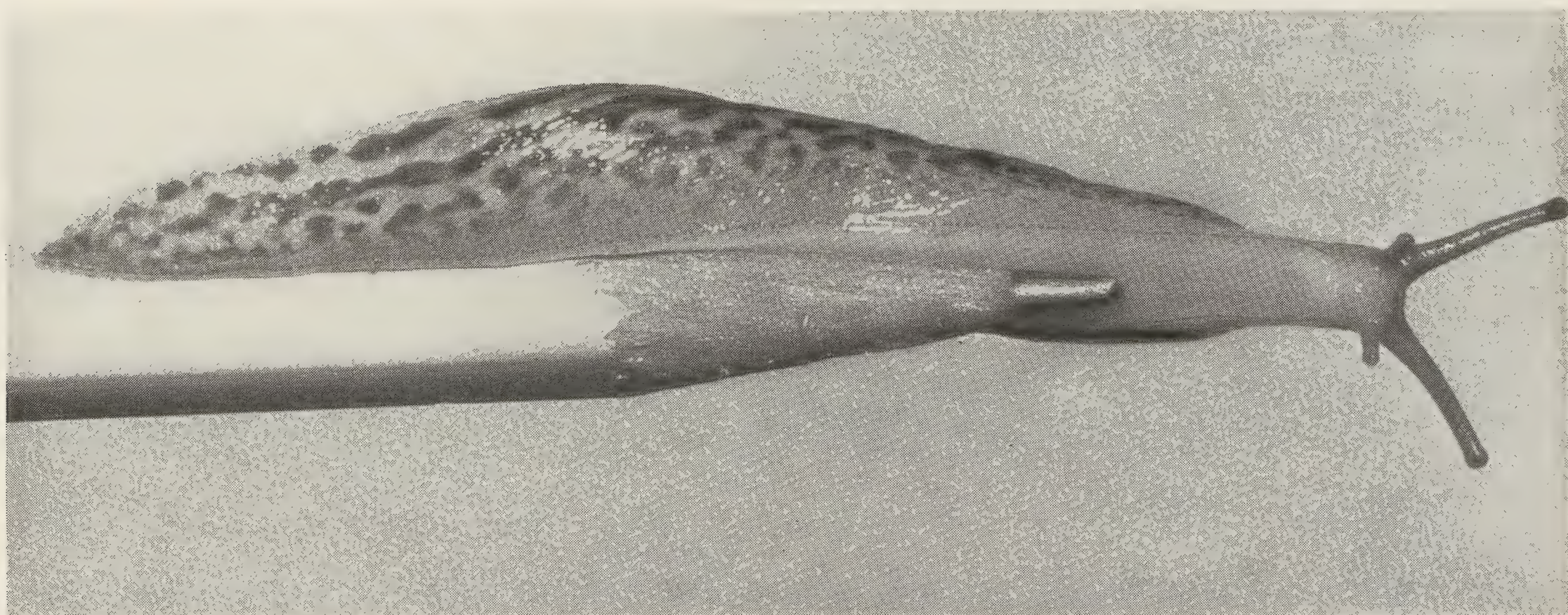


Photo by Jack Layer—Journal-American

A SPOTLIGHT FOCUSED ON THE BACK OF A SLUG INDUCED IT TO START MOVING, BUT IT PERSISTED IN TRAVELING IN A SPIRAL. STARTED ON A PENCIL, IT HELD A POSE MOMENTARILY IN MID-AIR.



Photo by Jack Layer—Journal-American

SOME ANIMALS like to climb a pole, so for photographic purposes it is best to give them a twig that reaches to the center of the ground-glass view-finder of the camera. The Cloaked Knotty-horn Beetle was that kind of an animal. Its back is bright yellow and blue, its antennae knobbed at the joints.



Photo by Jack Layer—Journal-American

OTHER ANIMALS strike a natural pose without any great manipulation — such as the female Promethea Moth, which clasped its cocoon for several hours after it emerged. The escape hole can be seen at the lower end of the cocoon. Under such conditions, photography is a comparatively simple matter.





Photo by Jack Layer—Journal-American

LIZARDS enjoy having their back scratched and when Curator Eddy gently tickled the rough hide of this Texas Horned Lizard, the spiny little fellow perked up its head and inflated its body in sheer delight — even though the expression of its face remained glum throughout the whole procedure.

Layer and of the newspaper. The undertaking has required great patience, pictorial technique and special equipment, and the Zoological Park has been happy to cooperate because of the really great public interest that has been aroused.

Every picture has presented peculiar problems, the solution of which had to take into consideration the individual habits of the subjects and their responses to various stimuli. Some animals

like to walk a plank — so a plank was held in sharp focus, and the animal given a chance to follow its natural inclinations. Others prefer to climb straight up, or respond to gentle stroking, or could be manipulated by food. Often it was difficult to predict which would tire first — the stubborn subject, the photographer or the Curator of Insects, who had the job of coaxing the subjects into position!

◀ **ONE REAL TRIUMPH** of Photographer Layer's work at the Zoological Park is this striking photograph of a Black Widow Spider, her web and her newly-hatched brood. The spider and her family posed contentedly as long as the web was not disturbed. Only once did the mother leave the egg balls, but a slight poke from beneath quickly placed her on guard again. Both she and her young are cannibalistic — which is one reason why they spin separate threads in order to get away from each other.

Photo by Jack Layer—Journal-American

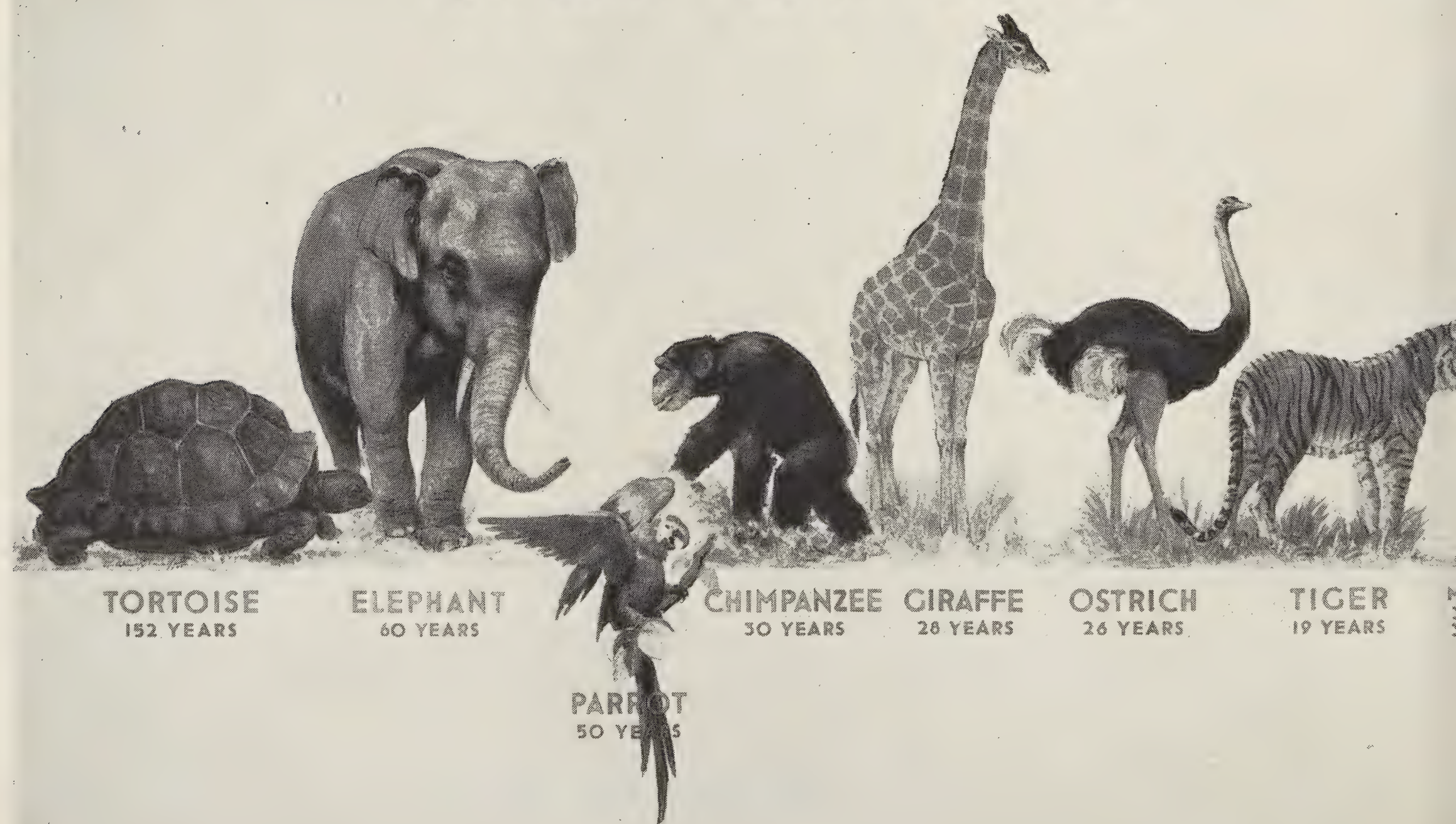
WEIGHTS MAMMALS AND BIRDS



Even the Walls Answer Questions!

A SURPRISINGLY large proportion of the questions that are asked the staff of the Zoological Park have to do with the weights attained by animals, their life-spans, the gestation periods of certain of them, and the truth of various "nature stories," or superstitions.

SPAN OF LIFE



STATION



Consequently, it was a happy thought to devote four of the bare walls in Question House, the Zoological Society's information center in the Zoo, to a striking series of murals that in quick and graphic manner illustrate the familiar questions and give the answers.

The staff of Question House has made a further discovery — that while the pictures answer some questions automatically, they suggest still others; visitors gaze and remark, "Well! I didn't know that!" and then go on: "Is it true that — ?" The murals are the work of Matthew Kalmenoff.

SUPERSTITIONS



An Open Letter to Our Members

By **DONALD T. CARLISLE**
Chairman, Membership Committee

DURING THE WAR YEARS, as many of you know, your Zoological Society was preparing detailed plans for the organization's future. The great success of African Plains and of our minor installations employing the same exhibition principles gave us the clearest of ideas for modernizing the Park — a work which will eventually require a considerable direct cash investment.

Since 1940 the Aquarium has been "under wraps"—operating a small series of small tanks in the Lion House and carrying on its highly important research activities under decidedly makeshift conditions. Not only New York City but the nation needs the reestablishment of this great institution including its invaluable marine biological work — and needs it soon.

These two projects — each calling for substantial cash investment — are subject to some postponement, due to current building shortages and to the simple fact that we have not the necessary money in hand.

Meanwhile, there is no reason why the other less tangible though fully as important work of your Society should not be materially advanced. A relatively small increase in the Society's income would enable us to add greatly to those Society services supported entirely out of Society funds. We refer specifically to our programs in Education, in Research and in Conservation.

Nobody Else Can Do This Work So Well

Students of the problem all agree that your Society is in a unique position to offer great public services in a time of need.

The tremendous popularity of the Park — by far the most popular institution in the City — the increasing demands for all our information ser-

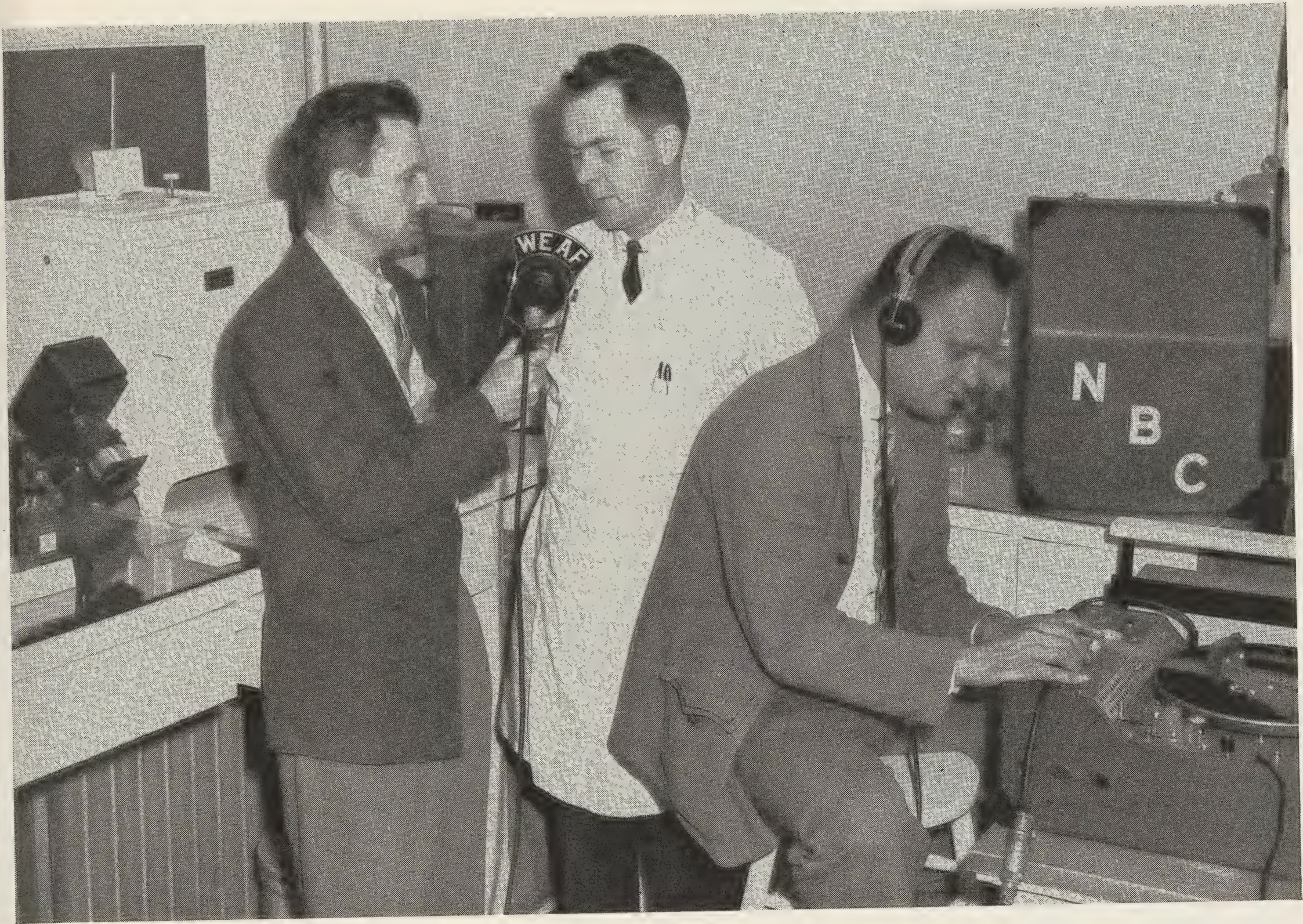
vices, indicate clearly that we should expand and intensify our educational facilities. We are in earnest conference with educational authorities for the purpose of developing a basic program for school use — one which will be of service not only to the schools in our immediate area, but, by extension, to schools everywhere. This, we are assured, is not only a practicable objective but a highly desirable one, since the greatest of western zoological societies is one of a pitifully few bodies that can help give children a basic grounding in the biological sciences. It is hoped that this program will be ready for trial application this fall.

Our educational program should not be carried forward by printed word alone. We are therefore working on plans for a series of educational films which will begin to establish your Society in its proper place as a source for visual educational material that it would be hard to duplicate.

Your Society is also asked to work with one of the big radio systems on television. A radio program is needed. If the small Society staff could but double its man-hours, we could easily quadruple the Society's influence — an influence of first importance in an age of mechanical science.

In the field of pure science your Society's opportunity is fully as great as in that of education. Our Scientific Advisory Council — six of the foremost men in their fields — has long since attested the opportunity for research in comparative biology and medicine afforded by the Park's hospital and the laboratories of the Aquarium.

It remains largely for us to increase our income in order to implement a program that will be of first significance. Not only medicine but industry call upon us regularly as a primary source for many data.



RADIO HAS LONG SINCE DISCOVERED THAT THE ZOO IS A TREASURY OF FASCINATING AND INSTRUCTIVE PROGRAMS. HERE A RECORDED BROADCAST IS IN THE MAKING IN OUR ANIMAL HOSPITAL.

Pending construction of a building to house the necessary staff and laboratories, the Society's program in Research must necessarily be held within rigid limits.

Our Significance in Conservation

As you by this time know, your Society will collaborate with the New York State Department of Conservation in the creation and maintenance of a Proving Ground of Conservation within the Park. This is the first installation of its kind — and it is of signal importance since it will be a most convincing exhibit of conservation needs, situated in the heart of the country's most intense population concentration. Conservation today has a bearing not only on the price of your food, clothing and shelter but upon their quantity. You may blame present shortages on the unsettled post-war economy, but you or your children may blame future shortages on the lack of conservation controls.

What is more important for the nation's future

welfare than that city people should be taught the principles of conservation — the need for a better system of protecting our land, our wildlife, our forests and our water supply against waste and destruction?

What Can You Do About It?

Our financial position is a sound one and we will not hazard it even for the sake of these most important goals, but to realize on our present opportunities substantial additional funds are needed.

The membership of the Society is not large — although it is nearly double that of a year ago.

We have made a careful analysis of the situation, and have arrived at some conclusions which will hold for the present.

The Society needs more members. Our base should be materially broadened among people who have an interest, direct or indirect, in any or all of our fields of effort. It is apparent that not enough people understand that the Society alone

foots the bill for its work in education, research and conservation — and that it pays and always has paid a large share of the maintenance costs of the Park and the Aquarium.

Too many people — many of them lifelong citizens of New York — think of the Park and the Aquarium simply as two of the many units in the Park system of the City. This of course is not the case.

We therefore appeal to the membership to send us more and more members. A year ago we asked for Members and your response was of great aid in the 1945 drive. This year we asked only for prospects. The response was gratifying. We are ahead of last year in new memberships,

but the lead is not great and summer is a bad time.

This autumn we will launch a most determined drive to bring in at least 1,000 new Members by year's end. In this you can help. *If you doubt this, bear in mind that one Member alone has brought in three Life and nearly fifty Annual Members — not just names but application cards accompanied by checks.* He also has made a substantial contribution to the Society's funds.

At this time we do not ask for money — badly as we need it. We ask for Members — more people who will know who we are and what we are doing. We must emphasize the importance of a broad membership base for our future needs.

New Members of the New York Zoological Society since the last issue of ANIMAL KINGDOM

Aaron, Jack
Abramson, Paul W.
Baker, C. B., Jr.
Bartlett, E. D.
Bird, S. Hinman
Bloomingdale, Lyman G.
Brainard, Vietor
Brick, George H.
Burger, J. P.
Chiang Yee
Cohan, Max J.
Coolidge, John T., Jr.
Darrow, Mr. & Mrs. Whitney
Davis, Harry
Davis, Joseph
De Camp, C., M.D.
Du Mond, Joseph
Eskesen, Mrs. T. R.
Frank, Johnny
Fleischman, Mrs. Edwin M.
Florich, Thomas C.
Fried, Nathan
Friedman, Leonard
Frisbie, Kenerth
Gertz, Edward M.
Goldstein, Dan
Goldstein, Martin
Gordon, Miss Isabel S.
Goulder, M. K.

Gruhn, M. Mitchell
Haeseler, Mrs. Kurt W.
Halle, Mrs. Wm., Jr.
Hammett, John E., M.D.
Hopson, George H., M.D.
Hotaling, David
Jaegar, Theodore
Jaffin, Abraham E., M.D.
Kaplan, Henry C.
Kessler, Bernard Milton
Kienbusch, Carl Otto von
Kragh, Charles H.
Landegger, Karl F.
Lazare, Louis
Levesen, James A.
Levine, Alex
Lipper, Arthur, Jr.
MacDonald, Harold E.
Magid, Leon
Marks, Henry C.
Marshall, Charles A.
Mazur, Michael
Metcalf, Charles A.
Morrone, Michael Francis
Moss, Ben S.
Muehlstein, Julius
Oberfelder, Walter S.
Parsons, Mrs. J. Graham
Pasha El-Negami, General Abdallah

Peterson, A. Hawley
Platt, Frederick Putnam
Rauh, Louis
Reich, Sydney
Rosen, Felix T.
Rosen, Morris
Rouse, Harold A.
Sahle, Harry F.
Sandor, Paul
Seeman, J. Stanley
Seemann, Harry
Sokolow, B. D.
Spitzer, Robert
Steinhardt, Wm. B.
Steuer, Aron
Stolper, Joel
Stone, Maurice L.
Strauss, C. M.
Swan, Mrs. Thomas W.
Sydney, Manuel G.
Tieger, William A.
Vietor, Miss Diana
Warner, Allen
Weinstock, Sydney A.
Wever, George D.
White, Thomas J., M.D.
Williams, Ernest
Williams, Miss Jane E.

THE ARTIST AT WORK IN
THE VINCENNES ZOO, ON
A PELICAN IN MARBLE

Photo by Maurice Poplin

An Artist

By CORNELIA VAN A. CHAPIN, N.A.

AT THIS TIME, when artists are eager to take part with their fellows in the creation of a bright new world, it is gratifying to have the New York Zoological Society come out with a reaffirmation of its sponsorship of animal art as "an important business" of the Society.

To the practising artist such a statement is encouraging, for it means a recognition of the fact that art should be a part of the normal interest of the community, of which our Society is certainly a fine cross-section.

Not content with making the statement, however, the powers-that-be went further this spring and revived the custom of holding art exhibitions by bringing together a varied showing of animal art, carried out by a number of their Members working in many mediums.

This, they tell us, is just a beginning. But here, at the Heads and Horns Museum, the passing visitor, bent on "a good time at the Zoo" could come across colorful evidence of practical use made of the display of wild life, translated



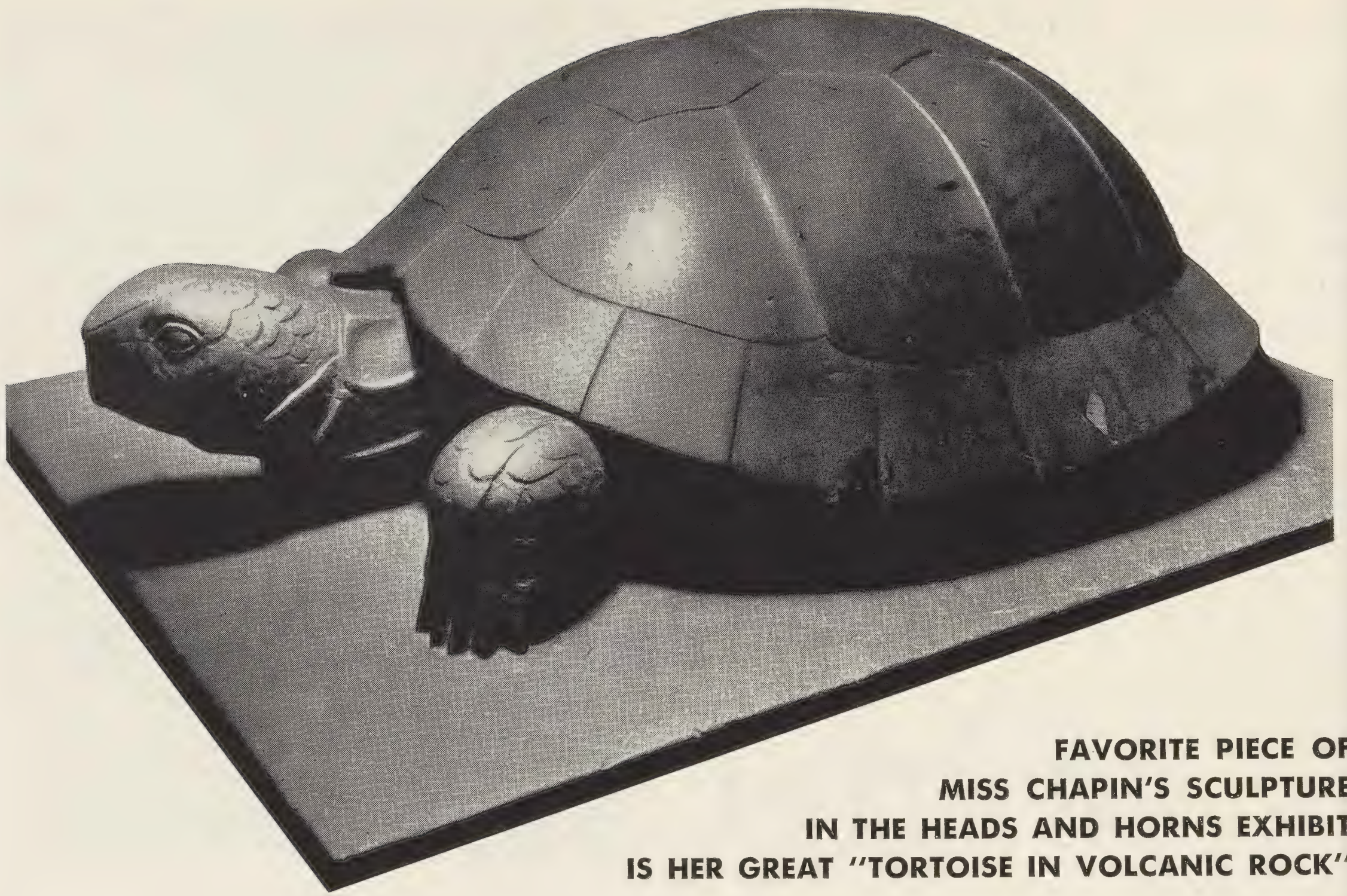
Looks At the Zoo

into painting, textiles and sculpture. And before he knew what had happened to him, this same visitor had been to an art show and liked it!

At the exhibition of course were shown the culmination of years of work and adventure by the individual artists, adventures that some of them owed directly to the expeditions organized by the Zoological Society, from which they brought back amazing studies of animal and insect life to work up into illustrations for children's books, murals, carvings and decorative textiles.

So much for the ordinary visitor. But there are often to be found in the Park groups of sketch classes who descend on the scene like colorful and devouring locusts and try to capture the illusive actions of the beasts they admire "that just won't stand still."

Certainly there is no better training for eye and hand than this effort to catch the essential volume and direction of living form and no better place to practise it than among the varied and



**FAVORITE PIECE OF
MISS CHAPIN'S SCULPTURE
IN THE HEADS AND HORNS EXHIBIT
IS HER GREAT "TORTOISE IN VOLCANIC ROCK"**

beautiful specimens in our Zoological Parks.

There is much to be learned, too, in patient study of animal habits, and a wise precaution for a young aspirant is not to choose for his subject a creature of which there is only a single specimen available.

That way, he loses endless time waiting for the model to resume a chosen attitude. In a group of birds or beasts there is usually one which will be "in position" if one chooses an attitude that is characteristic of his kind — not some dramatic action viewed in a flash and probably not to be repeated within the time of one's visit.

It is this that makes for discouragement. Yet it can be overcome by learning the animal's habits. Find out, by careful observation and timing, just when in the day the creature is given to lying down, if you want him in that pose, and don't blame him if you are late for the rendezvous and find him sauntering about intent on some business of his own. Study him then for other characteristics and details to incorporate into your work and so gain a well-rounded understanding of the subject without losing your

temper at him or at yourself.

Now that the Park is developing more and more along the lines of the African Plains and the Gibbon Island, where the animals appear to be unhampered by any but natural restrictions, the artist has the added stimulus of seeing his models at a greater advantage and the opportunity of studying them in normal and graceful locomotion as well as being able to concentrate on their anatomy at close range.

It was in the days of cages only that I first went to the Bronx Zoo, young and very shy, to try to model a Kangaroo. Crowded up against the railing I watched and worked, while a number of them exercised in their outdoor runways, and the small boy public did its best to distract me and the animals.

Much of the distraction was in a well-meant effort to help me. But much — especially the adult adoring parent, who interrupted my effort to explain that her little Willie "never had a lesson in his life but loves to do what you are doing" — was so hampering that finally one day I got up courage to speak to a keeper and ask

if I might have one of the Kangaroos for a little while in the indoor cage.

He was a kindly man and took pity on me. After a few minutes the little doorway opened and in came a lively specimen. I was enchanted and thanked my keeper friend profusely. What was my astonishment to have him reprove me with "just a minute, young lady, that's not the one you're doing. You're doing the big goil."

To have my little model recognized by this expert gave me my first reassurance and sense of possible success. I wish that he might know that the "Wallaby Kangaroo" he God-fathered actually was the first piece of sculpture I ever sold and probably influenced the career I have followed of animal sculptor!

One finds many such instances of interest and friendly cooperation at the Bronx Zoo today and an untiring amiability in answering questions, one of the first steps to greater knowledge and appreciation on the part of the public and a feeling that the Zoological Park belongs to them.

With the planting of flowers and the use of color in the new type of bird houses one is led to believe that the birds themselves have put on brighter plumage to lure the painters to admire them and to make use of their new beauty.

Some day, perhaps, the Zoological Society will

again have actual studios for the artists to work in. One such did exist in the Lion House, they tell me, long ago, but that has been made over into the enchanting nursery for the raising of very young and valuable animals.

It may be that a donor could be found to dedicate a memorial building for the artists' use, such as was erected at the Vincennes Zoo on the outskirts of Paris. Here a series of studios were built to the memory of a young painter-explorer who had been killed in the first World War. Constructed so that the most timorous or fiercest animals could be brought in close range to the artist under good lighting conditions, the building became one of the interest spots of the Park, and the waiting list was long for the opportunity to work there. Such a building, fittingly decorated by painter and sculptor, would make a colorful "living memorial" to all those who have done so much to increase man's knowledge of the Animal Kingdom.

Meanwhile, the opportunities are many to enjoy and study the lively models the Zoo provides, and in making its facilities available to the student and the established artist as well as the public in general, the Society has made a definite contribution for which we must all be profoundly grateful.



REPRESENTATIVE of Miss Chapin's sculpture is this Beetle in cast stone — an example of the in-

terest she has in unusual animal forms. Our current exhibit contains ten examples of her work.

TINY KILLER

By CHRISTOPHER W. COATES

AMONG the bizarre tales that come out of the Amazon country from time to time, not the least fearsome are those about the fish that eats men.

These creatures do not confine their attentions solely to men; they are catholic in their tastes and other fishes or birds and beasts that may have business, however short, in the waters inhabited by them, are likely to be attacked. The "fish that eats men" is, of course, the Piranha — or Piraya or Caribe as it may be called, depending on the locality and the language of the natives.

There are a number of different species in the group indicated by these names and the stories connected with them, possibly twenty, and the fish are found in most of the fresh waters of South America. Despite their reputation for ferocity, not more than two or three species exceed ten inches in length. Most are only six or seven inches long.

While the stories of their destructiveness may seem greatly exaggerated, and the small size of the fishes would seem to make damage to large creatures impossible, there actually is very little exaggeration. The killing of quite large animals, including even hogs and cattle, seems to be well substantiated.

One recorded story indicates that some of these fish completely skeletonized a 400-pound hog in ten minutes. The hog, after being shot, was lowered into the water by means of a pulley. A photographic record was made of the flesh being torn from the bones as fast as the carcass was lowered into the river.

Curiously enough, hunger does not seem to be the urge which drives the fishes into these frenzies of ripping and tearing, for they will bite off bits of soft tissue as long as any remains, dropping the flesh as fast as it is ripped loose. In the terrific excitement engendered by the taste of

flesh or the smell of blood, they are just as likely to bite and destroy each other.

It might be wondered how such animals can live together without constant disaster and eventual annihilation, unless they were somewhat solitary in habit. In their native streams they seem to scatter themselves at relatively safe intervals and only come together when drawn irresistibly by the chance to bite something.

Some collectors of fishes in Piranha-infested waters have reported netting all the fishes from a given stretch of water and finding only one or two Piranhas in fifty to a hundred yards of the stream. Subsequently they have thrown the eviscerated carcass of an animal into the water, and have reseeded it within a few minutes — to find literally hundreds of Piranhas.

In tanks of the New York Aquarium we have attempted to rear several Piranhas at a time, allowing them space far disproportionate to their size, but we have found that invariably, sooner or later, they tear each other to bits — or else some of them die of what appears to be fright. Certainly they hide from each other and have been found dead with no marks of fighting or injury. Even when specimens have been kept in the same tank but separated by a sheet of glass, it is long before they learn not to dash into hiding as soon as another specimen pokes his head from behind a stone or a cluster of plants.

All of the fishes in this group (basically the species of the genus *Serrasalmus*) are equipped with strong, sharp teeth mounted in extremely heavy, undershot jaws. The bite they inflict is a clean bite, not a seizing and a tearing. So strong are the jaws that on one occasion, as we were seeking to save a fish being bitten apart by its own brothers and sisters, the fish seized the surgical tweezers we were manipulating in the water. The hard steel of the tweezers was actually marked and nicked by the teeth!



FEARSOME ENOUGH in this photograph, yet more terrible still in the fresh-water streams of South America, is the Piranha. This happens to be a dead specimen of one of the larger species, approximately ten inches long — large enough so that the deadly teeth can be seen plainly. Incidentally, the two holes that may be mistaken for eyes are actually the creature's nostrils; the eye is the large, round area just to the right of the black-centered nostril. The picture is considerably more than actual life-size.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

“Blue?” or “Cinnamon?”

The American Black Bear is normally a black animal, with tan muzzle and sometimes a white marking on the chest. However, it is much given to color variations, as evidenced by the common occurrence of cinnamon cubs, often in the same litter with blacks.

As far as we can learn, the blue phase has been recorded only from the Yakutat Bay region of southwestern Alaska. So when Clayton Seagars, Director of Education for the New York State Conservation Department, appeared at the Eleventh North American Wildlife Conference in March, 1946, with a tiny blue cub with tan muzzle and ears, we naturally wanted it. And on July 4, we got it, along with its black brother and sister.

Successive molts have dulled the distinctive gray-blue infant coat with an overtone of brown, so that now we are uncertain as to what the final shade will be. But, if the worst should happen, we can still say it *was* a Blue Bear! — LEE S. CRANDALL.

* * *

Three hundred and eighty employees of the Zoological Park and the Aquarium were X-rayed for detection of early tuberculosis on July 13, as part of a city-wide campaign by the Department of Health to detect and eradicate the disease in the city. The examinations were performed in 3½ hours, in the First Aid building in the Service Yard, by means of a new, high-speed X-ray unit provided by the Bronx County office of the Department of Health.

Zoo Problem

Over the years almost every sort of animal management problem falls to the lot of the animal keepers, but a new one came along in July. A White-tailed Deer, quartered in the Moose paddock, was found to have stepped into the

mouth of a broken milk bottle which had been flung into the enclosure sometime previously — and was hobbling around with a ring of jagged glass encircling one forefoot.

The glass presented a hazard not only to the victim but to other deer in the enclosure and it was necessary to remove it as quickly as possible. Keepers entered the paddock, worked the animal gradually toward a fence, and finally pressed it against the wire and held it there while another keeper, working from outside, lifted the hoof and slipped the glass ring off. Then the deer was released and it bounded away.

* * *

John Tee-Van, Executive Secretary of the Zoological Park, went to the Society's Tropical Research Station at Rancho Grande, Venezuela, early in July for a month's visit with Dr. William Beebe and his staff.

Two Old Friends Gone

Two celebrated inhabitants of the Zoological Park died during July. “Mike,” the young Orangutan, succumbed on July 12 to an incurable tubercular pneumonia, and “Rex,” our magnificent King Cobra, was found dead on July 15.

Mike came to the Zoological Park on July 2, 1938, when he was a baby of about two years, weighing 22 pounds. He weighed only 86 pounds at death, although he had been losing weight in recent months and probably had attained a peak of about 125 pounds a year or more ago. After autopsy by Dr. Leonard J. Goss, various organs were sent to hospitals and research laboratories all over the country for comparative anatomy studies. Mike's brain has been deposited in the Tilney Brain Collection at the College of Physicians and Surgeons in New York.

The King Cobra was found on measurement after death to be 13 feet 1 inch long. It weighed 12.65 pounds.

Benny Learns Her Way About

Successive stages in the career of Benny (really Benita, since she is a female), our young California Sealion, have been reported from time to time in *ANIMAL KINGDOM*. The latest report is that Benny has learned to hold her own in competition with her elders for fish at feeding time.

It was many months before Benny learned to swim, many more months before she could be weaned and induced to sample the fish that her adult pool-mates found so delicious. Even after Benny learned to accept fish, she was timid about seizing them when they were thrown into the water, and her usual reaction was to flee to the furthest side of the pool when a fish fell near her.

Now, at the age of two years, she has more speed and agility than any of the other Sealions, and she dashes for any and all fish. Generally the adults pursue her, whereupon she shoots in a tight circle around one of the concrete islands in the pool — and the pursuer, unable to turn so quickly, flies off at a tangent. Benny then has leisure to play with her fish and swallow it in peace and quiet.

“Pete,” the Hippo, Is Weighed

As a means of marking the forty-third birthday of “Pete,” our Hippopotamus, and of signaling forty years of his residence in the Zoological Park, the animal was weighed on July 13 by the water-displacement method. And, somewhat to our surprise, since estimates of his weight in recent years had placed him at about 4,500 pounds, he appears to be a mere 3,800 pounds.

The method of weighing Pete was devised by John Tee-Van, the Park’s Executive Secretary, and Quentin M. Schubert, the Superintendent of Construction and Maintenance. By making exact measurements of the capacity of Pete’s swimming tank, adjoining his stall in the Elephant House, and then installing a float that would rise as Pete entered the water and raised its level, it was possible to determine accurately the amount of water displaced by the bulk of the animal.

From that point, however, weighing Pete is based on the assumption that the specific gravity of a Hippopotamus is the same — or very nearly



FIRST AID is always available in the Zoological Park in a small but completely equipped hut beyond the gate at the end of this pleasant walk. A Registered Nurse is constantly in attendance.

the same — as that of water. The weight of water is $62\frac{1}{2}$ pounds per cubic foot, and an object of the same specific gravity as water would weigh as much as the volume of water displaced.

The weighing device, with its scale and moving arm, will be left permanently in place on Pete’s tank, and should interest thousands of visitors, for Pete often goes swimming. A further display calling attention to him as the oldest inhabitant of the Zoological Park has been set up on the fence surrounding his out-of-doors



ANIMAL ART by Members of the Zoological Society forms this exhibition which was opened in the Heads and Horns Museum Gallery on Members' Day this spring. Sculpture, painting, textiles and wood-carvings are the media; it is the most successful and striking of many art shows we have held.

corral. It shows photographs of Pete as a three-year-old when he first came to the Zoological Park in 1906, and of his thirtieth birthday party in 1933.

A Friendly Note from England

Although the Zoological Park is assumed to have enormous recreational and educational value, it is seldom that the staff has direct testimony of those qualities. All the more interesting, then, is the following letter received during July from Mrs. Margaret Wilson whose home is in the north of England. The letter was addressed to the Zoological Society.

"In 1940 my home was bombed to the ground by German planes and we were pretty badly shaken, so my three-year-old son and myself sailed for New York where we were well cared for and loved.

"However, we had very little money and it became my custom to bring my son to your grand Zoo three or four times a week. In that time he came to know every beast, bird and insect in it, and with the help of your Guide Book, which I bought for him, he developed a grand knowledge of your whole place and its contents, and at times

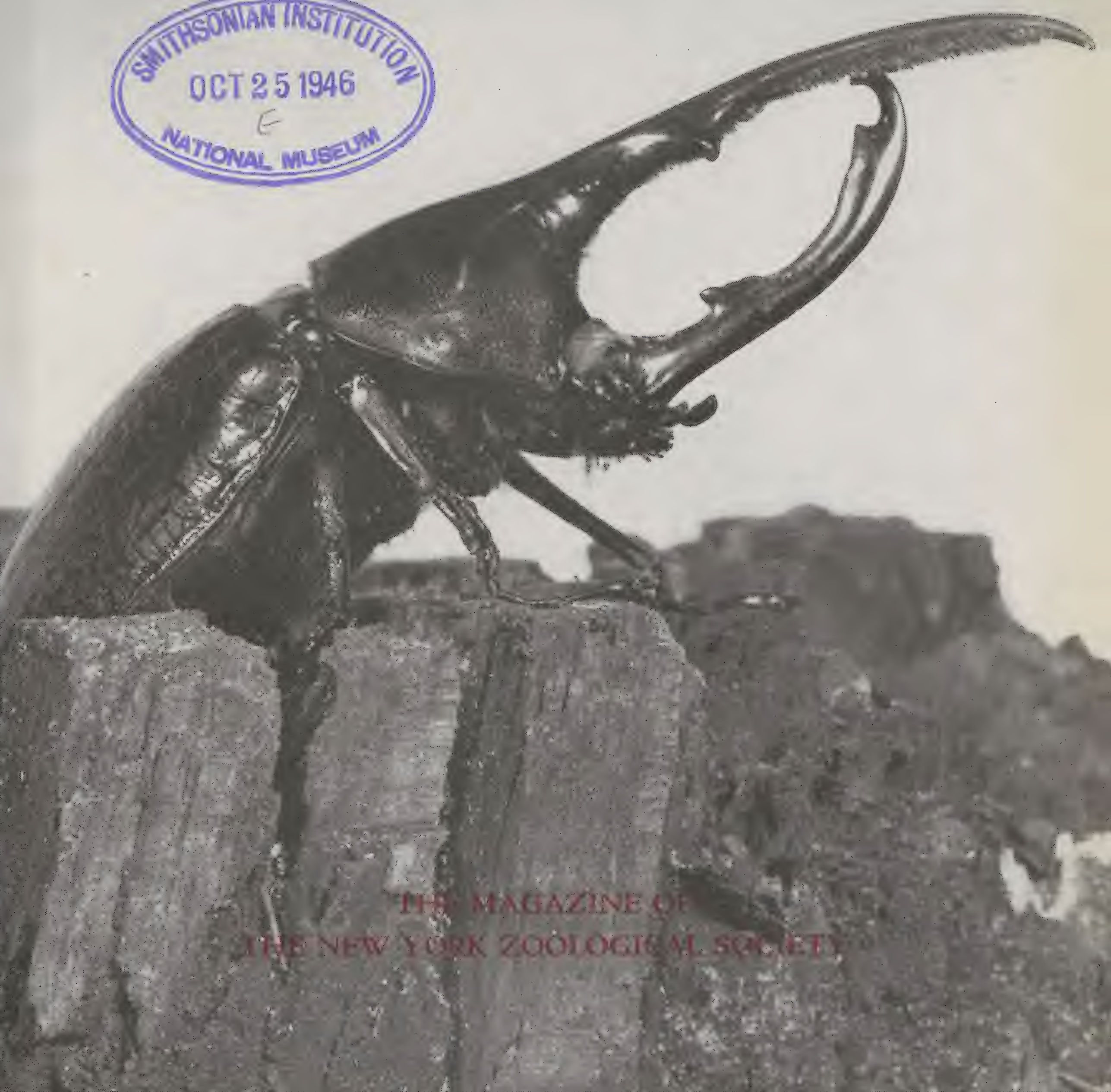
he surprises everyone.

"In 1941, just before your country entered the war, things were so black in England that we thought our only hope of seeing our people again was to return, so although I still think the U.S.A. is the greatest country in the world, England is home, and so we came back to be bombed out again and again, but, thank God, none of us were ever hurt. To the shelter every night I took my son—he and his Guide to the New York Zoological Park. Now my son is nine years of age and in the past years we had many U.S. soldiers in our home and my son has grown to know and love your country until he is now saving up to pay you another and happier visit. He reads that annual membership in your Society is \$10. We can't afford that, but is it possible to have only your annual report and illustrated books cheaper?

"If you think this letter is an imposition, please don't give it another thought, but I am writing it for my son and I am sure if you could see and hear him, you would be very interested in him and help him. His name is Gerald."

We are glad to report that a number of publications are being sent to Gerald with the compliments of the Zoological Society.

ANIMAL KINGDOM



THE MAGAZINE OF
THE NEW YORK ZOOLOGICAL SOCIETY

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York 20, N. Y.

PRESIDENT
Fairfield Osborn

FIRST VICE-PRESIDENT
Alfred Ely

SECOND VICE-PRESIDENT
Laurance S. Rockefeller

SECRETARY
Harold J. O'Connell

TREASURER
Cornelius R. Agnew

EXECUTIVE COMMITTEE
Laurance S. Rockefeller, *Chairman*

Cornelius R. Agnew
Alfred Ely
De Forest Grant

Warren Kinney
William De Forest Manice

David H. McAlpin
Robert Moses

Harold J. O'Connell
Fairfield Osborn
J. Watson Webb

BOARD OF TRUSTEES

Class of 1947

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez

De Forest Grant
Eugene Holman
Warren Kinney

Henry R. Luce
William De Forest Manice
Harold J. O'Connell

Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1948

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely

Marshall Field
Childs Frick
Archer M. Huntington

David H. McAlpin
John H. H. Phipps

Clendenin J. Ryan
Harrison Williams

Class of 1949

George C. Clark
F. Trubee Davison

Jay Downer
Robert I. Gannon

Robert Gordon McKay
Fairfield Osborn

Laurance S. Rockefeller
John M. Schiff
Frederic C. Walcott

Ex-Officio, The City of New York

The Mayor, Hon. William O'Dwyer

Commissioner of Parks, Hon. Robert Moses

STAFF

GENERAL

John Tee-Van *Executive Secretary*
Jean Delacour *Technical Adviser* Herbert F. Schiemann *Comptroller*
William Bridges . . . *Editor & Curator, Publications* Sam Dunton *Photographer*
Myrtice A. Blatchley . . . *Associate in Charge, Department of Education*

ZOOLOGICAL PARK

Lee S. Crandall *General Curator*
Brayton Eddy . . . *Curator of Reptiles & Insects* Leonard J. Goss *Veterinarian*
Edward Kearney . . . *Manager, Facilities Dept.* Grace Davall . . . *Assistant to General Curator*
Quentin Melling Schubert, *Superintendent, Construction and Maintenance*
W. Reid Blair *Director Emeritus* William Beebe *Honorary Curator, Birds*

AQUARIUM

Christopher W. Coates . . *Curator and Aquarist* C. M. Breder, Jr. . *Research Associate in Ichthyology*
Ross F. Nigrelli *Pathologist* George M. Smith . *Research Associate in Pathology*
Myron Gordon *Assistant Curator* Homer W. Smith . *Research Associate in Physiology*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*
Jocelyn Crane *Research Zoologist* Henry Fleming *Entomologist*

Associates

William K. Gregory
John Tee-Van

Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

VOL. XLIX

OCTOBER 18, 1946

No. 5

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York 20, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York 60, N. Y. Title registered with United States Patent Office.

Subscription, \$2.50 a year; single copy, 50 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

MAN AND THE BIOLOGICAL SCHEME

THERE IS AGREEMENT now among most anthropologists that we humans have existed as a species for the better part of a million years. Quite a span of time — unless we stop to recall that some of the dinosaurs made a good thing out of life for about a hundred times as long. As far as recorded history is concerned, we human beings seem to have spent about one percent of the span of our existence in what is called a state of CIVILIZATION. Some people think there is another name for it. Any way you look at it, however, we have not been in our present mode of life very long. Bringing it down to the life span of an individual, it is as if someone thirty years of age had lived as a savage for more than twenty-nine and one-half years and started to experiment with being civilized only three or four months before his thirtieth birthday. In these tumultuous days we need to cast around for all the explanations that we can find as to why nations and individuals act as they do. The above thought is perhaps of some comfort. We can count on the fact that *Homo sapiens* is ingenious and adaptable to such a degree that somehow he ought to be able to discover a political or social formula that will prove workable.

If only man would stop wasting and destroying the natural living resources upon which his existence depends! This does not seem to be under discussion at the United Nations' meetings these days in Paris. THE CLEAREST FACT OF ALL is that the survival of the human experiment depends upon the conservation of the basic life resources of the earth — forests, animal life, productive soils and water sources. If only we would not forget that we are a part of the whole great biological scheme that makes this earth a place on which life is possible at all.

Fairfield Osborn

IN THIS ISSUE

Hercules Beetle	Sam Dunton	COVER
Newsletter: The Belgian Congo's Gift to the New York Zoological Society	William Bridges	158
Five Ways of Obtaining Animals	Lee S. Crandall	165
Lord of the Northern Trails	Ben East	171
Bird Housekeeping		177
An Expedition Your Friends Will Wish to Join	Donald T. Carlisle	181
The Last of a Species	William Bridges	183
Behind the Scenes: News and Notes		187

Newsletter:

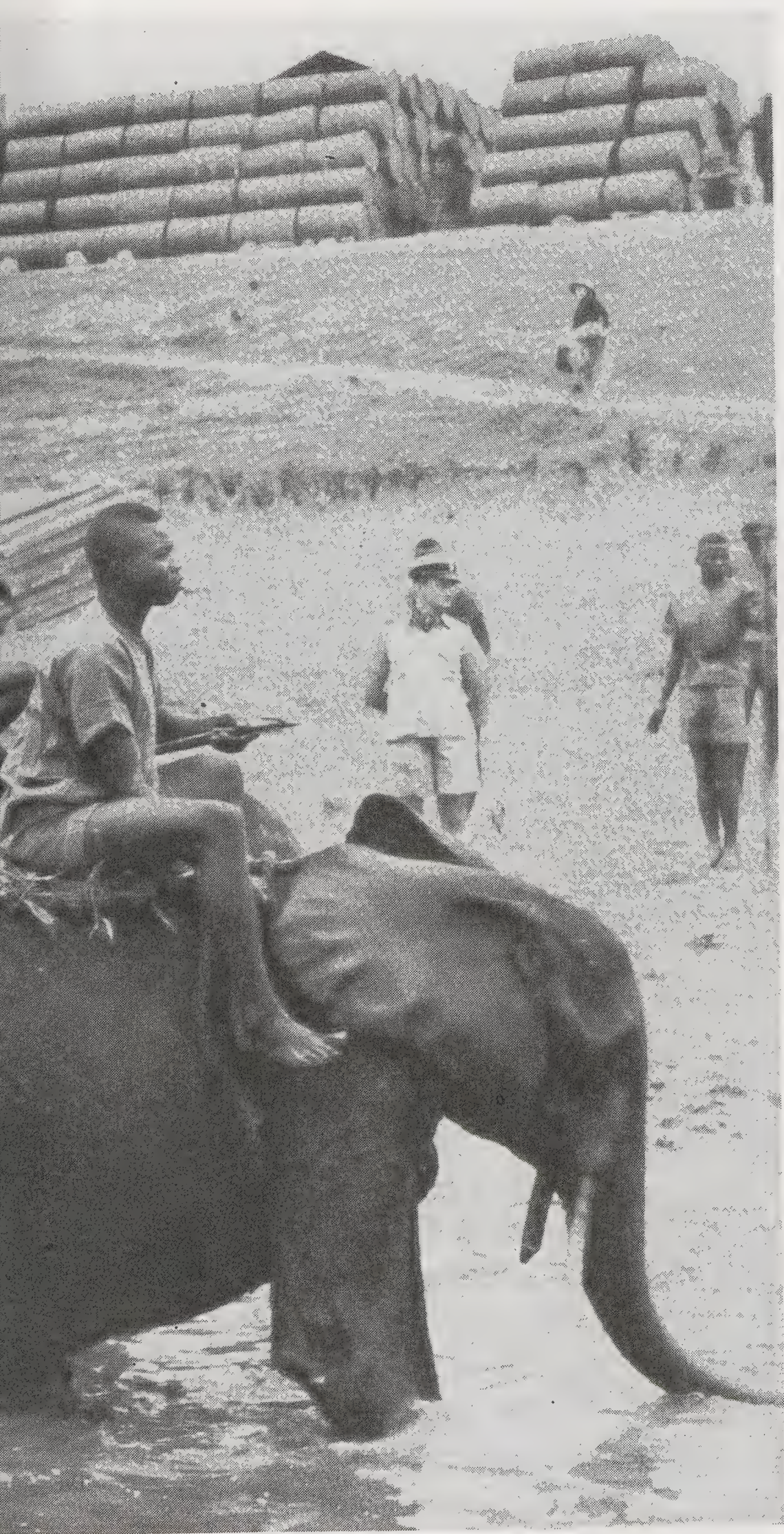
THE BELGIUM CONGO'S GIFT TO THE NEW YORK ZOOLOGICAL SOCIETY

By WILLIAM BRIDGES



PART OF THE HERD OF ELEVEN ELEPHANTS BATHING

EDITOR'S NOTE: William Bridges, Curator of Publications, left New York on July 26 for the Belgian Congo to act as the Society's representative in meeting with the officials of the Belgian Government, to study wildlife and conservation methods in the National Parks, and also to facilitate the shipment of the three African elephants to the Zoological Park. Traveling by air, by way of London and Brussels, he reached Leopoldville in exactly one week and was there to meet the elephants when they arrived from the northeastern corner of the colony on August 16. He dispatched the elephants, crated, on August 28 in the care of Robert Montana, a keeper in the Elephant House in the Zoological Park, who had gone to the Congo by boat. Now, Mr. Bridges is making a tour of the Garamba and Albert National Parks in the Belgian Congo. He will return to New York early in October.



BELGIAN CONGO INFORMATION SERVICE, Photo by A. da Cruz
RIVER AFTER THEIR ARRIVAL IN LEOPOLDVILLE.

LEOPOLDVILLE, Belgian Congo, August 28 (By Air Mail).—By the time this news letter is published in *ANIMAL KINGDOM*, Zangelima, Doruma and Bamangwa should (“sauf imprevu” as they say here) be sniffing the air of the New World and powdering their backs with the dust of a new continent. Unless something goes radically wrong —“sauf imprevu”—their life in the New York Zoological Park will be a quiet continuation of their daily round of feeding, drinking, dusting, bathing here in the heart of Africa, for I never saw three quieter, steadier elephants, less given to excited trumpeting and temperamental outbursts.

As befits three elephants officially and graciously presented to the New York Zoological Society as “a recognition of the importance of its Zoological Garden and an acknowledgement of American cooperation with the Congo during the war,” these young specimens are hand-picked. They are the choice of a herd of eleven elephants selected from the three-score beasts at the Belgian Congo’s Elephant Domestication Station at Gangala-na-Bodio, near the border of the Anglo-Egyptian Sudan. They were chosen for physical fitness, for symmetry of tusks, for matching size and varying type (“forest” and “savannah” sub-species), and for the promise of growth and development. They are, indeed, a royal gift, fully worthy of a great colonial power, and the New York Zoological Society may with pride accept them in the name of the American people.

This wonderful accession to the collections at the Zoological Park resulted from a conversation a year or more ago between Mr. Laurance S. Rockefeller, an officer and trustee of the Society, and his friend and associate, Mr. Joseph Jennen, Minister Plenipotentiary of Belgium. Mr. Rockefeller mentioned the fact that plans for the further development of the “African Continent” in the Zoo included the showing of a small herd of African elephants in a large open area adjacent to the existing African Plains exhibit. Mr. Jennen immediately remarked that he thought his Government would be glad to assist in the acquisition of elephants. Accordingly, Mr. Robert Godding, Minister of Colonies, was approached, and he decided that the elephants would be provided as a gift to the Zoo from the Belgian Congo in recognition of the close friendship existing

with the United States. This gesture of generosity was communicated to the Zoological Park by Baron Silvercruys, Belgian Ambassador in Washington.

In subsequent articles I hope to outline (for I can scarcely hope to do any more) for the Members of the Zoological Society, the magnificent and inspiring conception of conservation which the Belgian government is putting into effect in its vast national park system in the Congo. There is nothing else like it in the world; it is a model of scientific management and study, and worthy of the closest observation by a Society such as ours. At the moment of writing I am on the eve of a tour of two of the four great national parks from which I hope to draw first-hand observations of operations and management.

The purpose of this first article from the Congo, however, is to provide what background is presently available on the three elephants that have been presented to the New York Zoological Society. They will arrive in New York under the rather difficult names that roll so easily from the tongues of their native keepers; Zangelima, the male, (pronounced with a hard "g" and with the accent on the second syllable); Doruma, one of the females, (accent on the second syllable); and Bamangwa, the other female, (accent on the second syllable). Their names are not suddenly manufactured products of a fanciful imagination — they are the registered names of these specific animals on the books of the Elephant Domestication Station. Three days ago I was in the Zoological Park in Leopoldville where all eleven elephants were temporarily quartered, and happened to encounter Col. Pierre Offermann, Game Warden for the entire Congo and Vice-President of the Zoological Society of Leopoldville. He had told me, in discussing arrangements for sending our three elephants to the port of Matadi near the mouth of the Congo, that three of the native attendants would accompany them on their rail journey from Leopoldville to Matadi.

"Which ones are they?" I asked. Nineteen black boys from the Elephant Domestication Station had conveyed the eleven elephants down the Congo, and although I had seen them performing their duties around the elephants, I had not sorted them out in my mind.

"Zangelima! Doruma! Bamangwa!" Col. Offermann shouted, and three tall, lithe boys leaped up from around a smouldering fire in their shelter hut on the edge of the elephant camp, and came smartly to attention.

"The one on the right is Talatala. He is Zangelima's attendant, or cornac, as we call them here," Col. Offermann told me. "Next is Kakasi, who takes care of Doruma. And the one on the left is Bilima, the sergeant, who will handle Bamangwa."

The three stood at attention, eyes unwavering, until Col. Offermann spoke a few words in Lingala, the only dialect they understand, and then they saluted and turned back to their fire. I gathered from the way their eyes flickered in my direction, that the Colonel was telling them I was there to take delivery of their particular charges and to ship them to New York. What conception they have of "New York" as a city, I cannot guess, for with the exception of Bilima and ancient Bakapame, their leader, none of them had been more than fifty miles away from their home villages a thousand miles up the Congo. Bilima had once briefly visited Philadelphia as attendant for three African elephants purchased by a circus; Bakapame, on the other hand, while he has never seen America, has handled elephants in India, and all over Africa. He is old and wise in elephant-lore — he was brought along, especially, on this journey to Leopoldville because of this experience in meeting every kind of elephant emergency. It is a pity that my knowledge of Lingala is confined to one word: "Awa!" meaning "There!" or "Stop there!" It is useful for directing taxi drivers, but hardly suitable for carrying on a conversation about elephants.

Zangelima, besides being the first male the Zoological Park has attempted to keep in a number of years, is the largest of the three animals — about 6 feet 3 inches at the shoulder. His tusks, or "defenses," as they are appropriately called in French, are about 18 inches long, and are naturally and dangerously pointed. Zangelima represents the "forest" type, with large ears rather more rounded than those of the savannah type, and decidedly flatter against the head. Captured on March 9, 1944, along the Navulutu River in the Garamba National Park, he was named for



BELGIAN CONGO INFORMATION SERVICE, *Photo by A. da Cruz*

THE FIRST ELEPHANT OUT OF THE BARGE, WHICH BROUGHT THE ELEVEN ELEPHANTS DOWN THE CONGO IS ZANGELIMA, THE BULL ELEPHANT, ONE OF THREE DESTINED FOR THE ZOOLOGICAL PARK.

the elephant hunter — one of the boys at the Gangala-na-Bodio Station — who was the chief instrument in his capture.

Doruma, the smaller of the two females, being only 5 feet 5 inches high, is also of the “forest” type. Her tusks are quite even and regular (all the tusks are beautifully matched) and are about 8 inches long. Doruma is named for a former chief of the Zande tribe, living near Gangala-na-Bodio. She was captured on March 15, 1944, on the right bank of the Garamba River, in the Garamba National Park.

It is especially interesting to possess, in Bamangwa, the second female, a specimen of the “bush” type, easily distinguishable by the fact that her ears have a longer, more pointed lobe, and their edges curl strongly inward, instead of lying flat against the body. Bamangwa (or Bamangue, as the name is sometimes written in French), has 8-inch tusks which flare outward more decidedly than those of Doruma. She was captured on March 6, 1943, in the Wililadi section of the Garamba National Park, along the Nagbwangili River. Her name is taken from a



AFTER THE LONG CONGO RIVER TREK, CORNACS GUIDE THEIR CHARGES THROUGH THE LEOPOLDVILLE STREETS.



THE ELEPHANT PARK IN THE LEOPOLDVILLE ZOO WHERE THE ELEPHANTS RESTED AFTER THEIR LONG JOURNEY.



THIS CRATE WAS TAKEN TO THE ZOO SO THE ELEPHANTS WOULD BE ACCUSTOMED TO ENTERING THE CRATES.

hill near the Elephant Domestication Station.

I have not had the time, nor have I the necessary intimate knowledge of elephant management, to form any substantial judgment of the temperament and developmental possibilities of the three elephants which the Belgian Congo Government has selected for its gift to America. But I *have* haunted the Leopoldville Zoo every day since the herd arrived on August 19, and I have seen them in the smoky dawn before the cornacs have brought their armloads of breakfast brush; I have seen them in mid-morning, at noon, in mid-afternoon, and in the quick dusk when they had been disturbed all day by photographers and curious numbers of the European colony here. And of all the eleven elephants, I had privately picked Zangelima, Doruma and Bamangwa as the three I *hoped* would be selected as the Congo's gift to us. Not only are they the most evenly matched as to tusks, but their dispositions seem to be uniformly good, they represent the two subspecies commonly found in the neighborhood of Gangala-na-Bodio, and they appeared quieter, steadier, more domesticated, or at least tamed — than any of the others in the herd.

Zangelima, being a male, a sex that is notoriously unreliable among elephants, may eventually give us trouble. *All* male elephants are troublemakers, sooner or later, they say. But a few days ago I watched Zangelima being caged for shipment to New York, and he obeyed his cornac almost with the obedience and responsiveness of a saddle-horse. The caging took place in a railroad yard, with freight trains shunting on the adjacent tracks, with engines blasting the early-morning air with their shrieks and screeches. Zangelima plucked grass through it all; he boggled once, he backed out twice, when his cornac urged him into the open door of the crate, but in he went on the third try, as steady as anyone could wish. The cornacs instantly threw a looped rope of soft hemp around one forefoot, to secure him while the rear door was being closed, and the strangeness of his cramped surroundings alarmed him and he attempted to back out. But Bakapame and Bilima were behind him, with blunt prods, and in a few seconds he capitulated. If we at the Zoological Park have no more trouble than that for at least a few years, Zangelima

may be considered a model male elephant.

Incidentally, Zangelima is estimated to be about 14 years old. Doruma is figured at 8 years, Bamangwa at 10. But Colonel Offermann and M. Louwers (present director of the Elephant Domestication Station) are the first to admit that estimates of elephant ages are merely estimates, so great is the difference in their rate of growth.

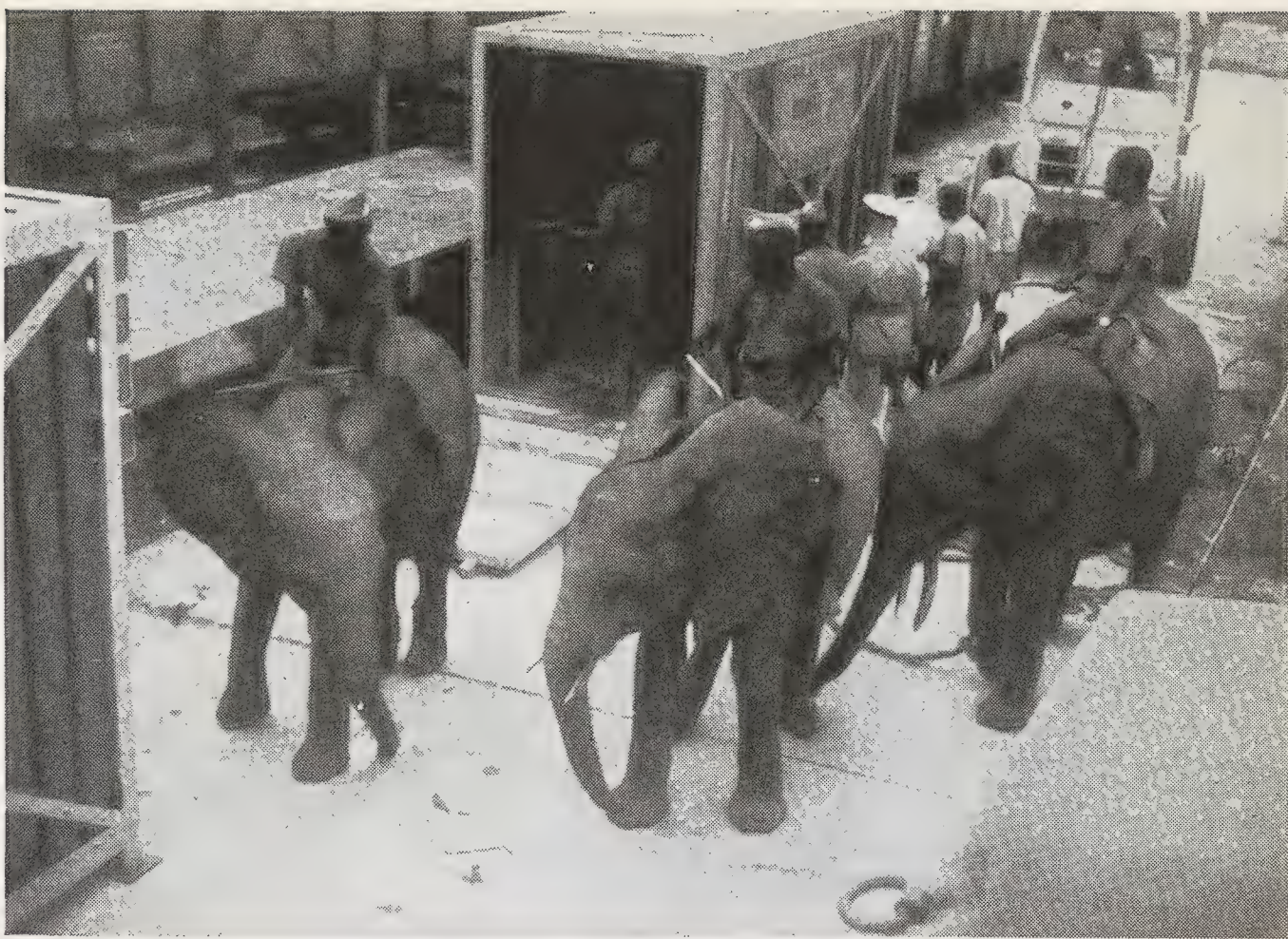
Our three new specimens (with Sudana, in our collection since 1931) will give the New York Zoological Park one of the largest, if not *the* largest, collections of African elephants ever seen in America. Our plans for exhibiting them in a large open area adjacent to the existing areas for antelopes and lions from Africa are spectacular and worthy of such magnificent young elephants.

Lest this newsletter run to exorbitant lengths, I must skip quickly over the story of their journey to Leopoldville. They set out from Gangalana-Bodio late in May, afoot, to travel the most direct road to Stanleyville, when they could be placed aboard a barge. Traveling from dusk to about 8 or 9 o'clock in the morning, they covered the approximately 480 miles in five weeks. By night they marched almost steadily, singing cornacs astride their backs, and by day they foraged in the brush, bathed, dusted themselves and rested. Twelve elephants started the journey. One died en route, from an abscess on its back, as nearly as could be determined. It fell by the wayside near the village of Wamba, and the carcass was abandoned to the natives of the village, who contemplated a feast of gigantic proportions.

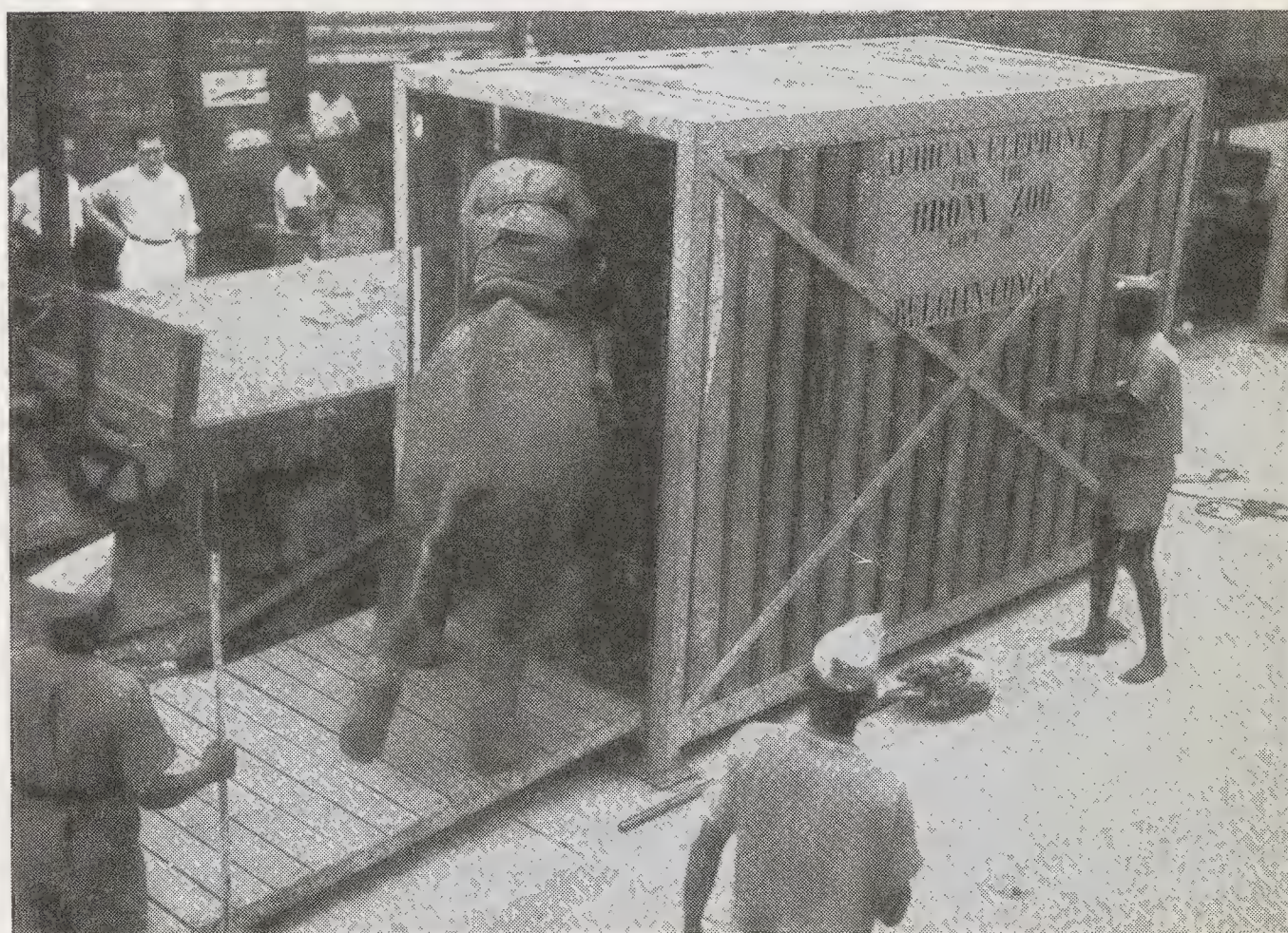
The elephants reached Stanleyville in early July, leaner than when they started, and they rested until July 28 when the down-river barge-train was formed. Despite the phenomenally low water of the Congo, the barge reached Leopoldville on Friday evening, August 16 — only 19 days out of Stanleyville, a little short of 1000 miles up the Congo.

It was too late to think of taking them off that night, but they were quickly and easily disembarked on Saturday morning. Their first action, ashore, was to plunge into the shallow shore waters of the Congo and soak themselves in its muddy current.

Then, when they had played enough, the



CITAS COMPANY YARDS WERE USED BECAUSE THEY HAD TRAVELLING CRANES TO LIFT THE CRATED ELEPHANTS.



A CORNAC RIDES ZANGELIMA INTO HIS CRATE. THIS WAS DANGEROUS BUT THESE ELEPHANTS COULDN'T BE LED.



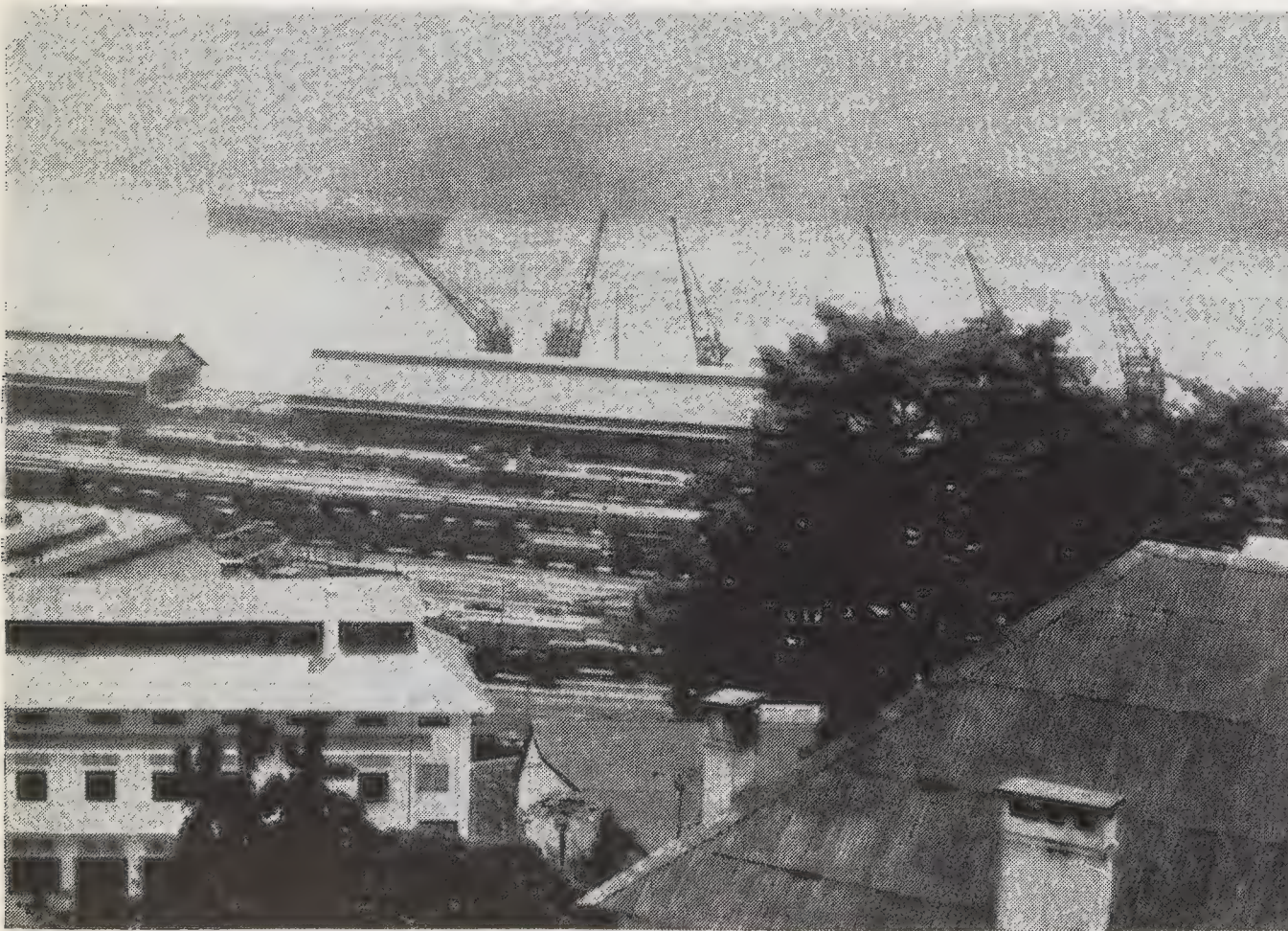
CLOSING THE DOOR ON DORUMA. ONE FRONT LEG HAS BEEN TIED TO THE CRATE TO PREVENT BACKING OUT.



THE FLATCARS HAVE DELIVERED THE CRATES TO MATADI AND THE CRATES ARE HOISTED ABOARD THE TAMERLANE.



CORNACS, WHO HAD ACCOMPANIED THE ELEPHANTS, WATCH THE TAMERLANE PULL AWAY FROM THE DOCK.



THE TAMERLANE SAILS INTO MID-STREAM. ZANGELIMA, BAMANGWA AND DORUMA HEAD FOR A NEW HOME.

cornacs shouted and urged, and the gray giants heaved themselves out of the water and formed a straggling line on the bank. Behind them were barges and tankers, a swarm of ship-side dockers who lined every rail to stare at the elephants with all the open-mouthed interest of American boys and girls. Farther behind was the vast, swirling plain of the Congo's waters — and in the hazy distance, the palms along the border of French Equatorial Africa. Ahead of them — a sloping bank, a river-side factory's maze of tracks and warehouses. To climb the bank meant leaving the familiar and facing the strange and the unknown — possibly the dangerous, for all these beasts of the African bush could know.

It was one of the most thrilling sights imaginable to see the gray bodies wheel into line, to see ancient, proud, impassive Bakapame step forward to lead the way, with his prodding stick held like a guidon, and to watch the elephants fall into a shuffling train behind him. Hunched on the shoulders of each were the cornacs in their olive-green dress uniforms of short-sleeved jacket and shorts. Bringing up the rear was Bilima, the sergeant, and as the elephants toiled up the slope he suddenly intoned a half-chanted, half-spoken sentence.

"Dinah-Dinah."

The cornacs straightened, caught up the phrase in unison, and their voices rose and fell in a rhythm that was purely African — and wholly "elephant Africa."

The song they chanted through the busy streets of Leopoldville, on their way to the camp in the Jardin Zoologique, was as old as elephant training. Now in the corrupt and almost unintelligible tamil (words brought into the language by traders long ago), now in slurred and half-formed Lingala, the song meant this:

"The journey is almost over. Your days of labor and fasting are done. Here there is plenty of food. Here are good people. They will not harm you. Continue, be good elephants."

Perhaps Zangelima and Doruma and Bamangwa will never hear that encouraging chant again. It is too peculiarly African to be transplanted to the New World, their new home. But the promise it held out to them, on the banks of the Congo, I am sure we will fulfill in the New York Zoological Park.

Five Ways of Obtaining Animals

By LEE S. CRANDALL

AFTER LONG YEARS of pictorial privation, when we had to search the files for ANIMAL KINGDOM material, it is a real joy to be able to present photographs of more recent additions to our collections. For new things are coming at last and our greatest problem will be thinking up how to report them. We can't always say "New Arrivals at the Bronx Zoo" or "This Month's New Animals." Maybe we don't need excuses but anyway, this time we are saying that the five subjects shown illustrate the chief sources of fresh material. They really do number five, in the main: gifts, purchases, expeditions, exchanges and births. We may have a little explaining to do here and there but at any rate, we shall have found a thread for our pictures, if not a very stout one!

Gifts are always numerous among our accessions and no lovelier representative of this category than the Ring-tailed Lemur, shown herewith, could possibly be found. "Ming" really belongs in our Servicemen's Series, but his exact source we have been unable to check. How he got from Madagascar to an Algerian "pub" we shall never know. At any rate, there he was found by a returning soldier, passed from one to another and finally reached the home of a Long Island family. Here "Ming" passed a good two years, which ended only when his marked antipathy for women got him into some mild difficulty. So now he is the great attraction of Mrs. Martini's Nursery Room, where his gentle manners (to men!) and perfect condition have established him as a favorite.

What better illustration of a purchase could be chosen than our beautiful new Uganda Giraffe?



LEMURS ARE NATIVE ONLY TO MADAGASCAR. WHEN THEY HAVE BEEN REARED BY HAND, AS WAS OUR RING-TAIL LEMUR "MING," THEY MAKE DELIGHTFUL AND CHARMING PETS.

We have been angling for a "Jill" for at least three years and shipping difficulties very nearly prevented her inclusion in this series. But she is here, safe, sound and photographed. And a better or more engaging young Giraffe no zoo ever owned.

Not only to save our pictures from monotonous devotion to mammals, but for a definite value of their own, we include the battling Hercules

(Continued on Page 170)



NOW AMONG THE RAREST OF ANTELOPES, THE ADDAX ONCE RANGED WIDELY ACROSS THE GREAT SAHARA. ITS PALE COLORATION AND SPREADING HOOFS ARE ADAPTATIONS TO LIFE IN THE DESERT.



OVER FIVE AND A HALF INCHES
IN LENGTH, HERCULES BEETLES
ARE AMONG THE LEADERS FOR
SIZE IN THE INSECT WORLD.

THE CHITINOUS ARMOR AND
LONG Pincer-LIKE PROJECTION
OF THE HERCULES BEETLE SUG-
GESTS A PUGNACIOUS TEMPER.



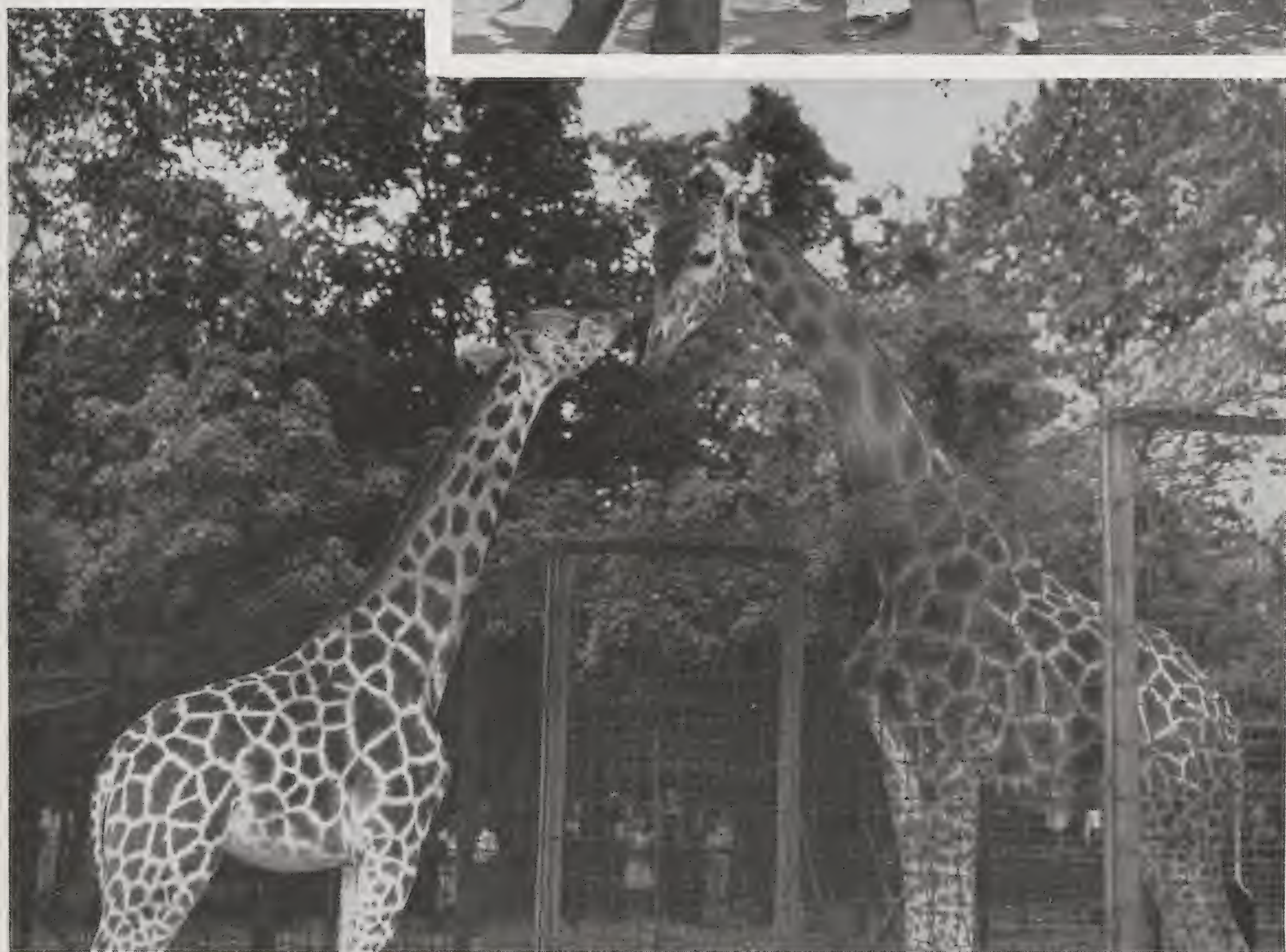


▲ Jill, our new Uganda Giraffe, arrives at the Zoological Park carefully crated. George Kress, Jill's keeper-to-be, introduces himself, the medium of this introduction is a banana which this new animal gratefully accepts.

◀ The crate is carefully lowered from the truck. While traveling from quarantine in Athenia, N. J., to the Park, a tarpaulin covered Jill's head to prevent her from becoming excited at the strange noises and sights en route.

► This young giraffe, used to an expansive terrain in her native East Africa, is only too glad to be released from her confining quarters of her crate. The park keepers rush to make a clear path for Jill's entrance into her enclosure.

▼ Jack, our Nubian Giraffe, was born in the Park in 1929. The newcomer is estimated to be about three years old and her immature height of ten feet, nine inches, seems dwarfed as Jack bends from his fifteen-and-a-half feet.





PRESUMED WILD ANCESTOR OF THE DOMESTIC LLAMA, THE GUANACO IS NOT A HANDSOME ANIMAL. BUT THE YOUNGSTERS, SOFT OF COAT AND GRACEFUL OF BODY, LEAVE LITTLE TO BE DESIRING.

Beetles. Also, they account for the expedition facet, for they were brought from Venezuela by John Tee-Van, on his return from a visit to Dr. Beebe's jungle laboratory.

The exchange angle is slightly strained but our new Addax must be brought in somehow. They really were acquired partly in exchange, for a spare Polar Bear brought a considerable reduction in their cost to us. These animals are the descendants of a shipment brought from Khartoum in pre-war years, to the Chicago Zoological Society. Once ranging far across the Sahara, searching for the plants that spring up even there

following the rains, the Addax is now an exceedingly rare antelope.

The Guanacos are frankly dragged in because they make such a beautiful group picture. They do represent acquisition by birth, the only drawback being that the youngsters are last year's. There is a single one this year but we shall hope to do better in future, as all of the infants are females. As the presumed wild ancestor of the domestic Llama, the adult Guanaco is not a beautiful animal. But the youngsters, with their soft coats and graceful bodies, answer every requirement of loveliness.



Photo by Ben East

MOOSE ARE POWERFUL SWIMMERS



Photo by Ben East

TWO BULLS FEED AT WATER'S EDGE

Lord of the Northern Trails

By **BEN EAST**

THE MOOSE and I met face to face at twenty paces.

I knew, before I topped the crest of the ridge, that he was there. In that knowledge, I am certain that I had the advantage of him. What I did not know, was that we would meet at such close range.

There was a natural salt lick and moose wallow on the slope below. I had seen the place a dozen times. Mineral water trickled out of the side of the hill and seeped away across the ground, and moose had used the seepage area as a wallow for many years. It was the gathering ground for every moose in that district. Their broad, hard-packed trails came in from all sides like the spokes of a huge, irregular wheel, some angling down the ridge, others winding up from the creek below. Most of the vegetation was worn away over a space as big as a city lot and in the center of the bare spot was the wallow itself, a deep bowl of mud and water twenty or thirty feet across.

You rarely passed there in summer without disturbing a moose at his mud bath or seeing evidence, in the roiled and bubbling water, that one had pulled out at the sound of your approach.

I halted this day just short of the crest of the ridge and listened for signs of moose in the wallow. Almost instantly I heard the floundering of a heavy body, a low contented grunting and then the sucking sound of long legs pulled up out of the heavy mud. After a few seconds the noises died away. I had surprised a moose,

apparently, but just as he was leaving the wallow.

I wanted to see him before he faded away into the timber. So when I heard nothing more after waiting half a minute, I walked softly over the top of the ridge.

The moose was standing sidewise, on the same well-worn runway I was following. He was much nearer than I had expected, and I halted involuntarily at the sight of him. He saw me in the same instant. His head lifted ever so slightly and his ears cocked forward. But for a moose surprised at sixty feet, he was astonishingly unruffled.

He was a big bull, dark and sleek. His antlers were still in the velvet but they were well formed and massive. I guessed his weight at not much less than a thousand pounds, and he bulked there among the trees, big and vaguely ominous.

I have little fear for most of the animals that walk the forest trails of North America. I know that now and then there is a trouble-maker among them, a bear or mountain lion with a chip on his shoulder, ready to pick a quarrel without cause. But such individuals are rare. For the most part the human being who gets into difficulties with his four-footed neighbors in the wilds of this continent has himself to blame. Nevertheless, something warned me now that I was in for trouble, that I faced one of the rare exceptions.

The time was mid-July. The rutting season of the moose tribe was months away. There was

no reason for this bull to be truculent and I had given him no cause for offense, save perhaps by surprising him at close quarters. An animal of that size has his personal dignity, of course, and he doesn't want it upset. Anyway, whatever the reason, I sensed that his attitude was definitely unfriendly and that he was not afraid of me.

There were plenty of trees available for climbing but I didn't relish the idea of being treed and perhaps held captive until dusk had fallen, meanwhile watching the moose trample my pack and its contents to shreds. I decided to bluff him out.

I slipped out of the pack, just in case, and shoved it out of the way in a clump of birches. Then I started talking to the bull. I didn't raise my voice. I spoke in easy conversational tones. I called him names and kidded him about his intentions. At the same time I started to walk slowly down the trail toward him. I had walked only three or four steps when he shook his head with a show of marked irritation. I stopped walking but went on trying to talk him out of it. He shook his head again and I decided the play-acting had gone far enough.

I was carrying a side arm, not a very satisfactory weapon for serious business with a half-ton moose but at least enough to put teeth into my bluff. I freed it from the holster and sent a shot smashing over his head. I confidently expected the blast of sound would break his nerve and startle him into headlong flight. Instead, his only reaction was to shake his head once more. Then I saw the coarse hair rising along his neck.

I had had enough. I backed away up the trail, slowly, step by step. When I was thirty yards from him I halted to see what he would do next. He watched me for another long minute, turned carelessly aside and walked off along the ridge. He passed within twenty feet of me, hardly bothering to look in my direction. When he was out of sight, I retrieved my pack and moved on, but for the next quarter-hour on the trail I kept a sharp watch across my shoulder.

That was as near as I have come to being charged by a moose — outside an enclosure. It was near enough. The biggest of American deer is ordinarily as wary and inoffensive as a rabbit, fleeing at sight or sound or smell of man, using all his wits and speed to avoid close contact,

let alone conflict. But now and again, for one reason or another, a moose turns quarrelsome, forgets to be afraid, looks upon a man with contempt or red-eyed rage. When that happens, he is a formidable antagonist and if the circumstances are right and the man unarmed the consequences can be serious.

Don't misunderstand me. I do not mean to imply that the moose rates along with the great brown bear of Alaska, the white bear of the far north, the grizzly of the west or even the wild boar of the southern mountains of the United States, as a dangerous big game animal. You may meet five hundred moose and never see one show fight. I know a man who has done that. And it is only fair to say that they are most likely to be quarrelsome in parks and game refuges where they are hunted little or not at all and so have not learned the power of man and his firearms. I only want to say that a moose will attack on rare occasions, unwounded and uncornered. If you are traveling through moose country, especially if camera hunting or some other errand brings you into close contact with this giant deer, keep your guard up and treat him with reasonable caution. Don't, in short, take too many liberties. He is lord of the northern trails, after all, and as such he is entitled to respect.

I have known three men who came to uninvited grief with bull moose, all in park areas. Two were treed by an irate young bull and kept on uncomfortable perches for hours. The third was attacked on the ground by a moose he had approached too closely in trying to make pictures. He escaped with minor cuts and bruises only because a dog from a nearby cabin came to his rescue.

All of my experience in moose hunting has been with cameras. That is an ideal way to hunt any big game animal if you want to get intimately acquainted with him. The effective range of a camera is, after all, far less than that of a high-powered rifle. You do your shooting on film at close quarters or not at all.

One common habit of moose makes them exceptionally easy to hunt with a camera. That is their trait of coming out to water in mid-day during the summer months to escape the horde of insect pests that harass them in their retreats in the deep timber.



MOOSE ESTABLISHED THIS MUCH USED MUD WALLOW AT A NATURAL SALT-LICK. THE SAME SCENE IN MID-WINTER SHOWS A FEW MOOSE STILL FREQUENT THE AREA, PROBABLY IN SEARCH OF SALT.

Photo by Ben East



Deer rarely show themselves in the open save in the very early morning and late afternoon. As a result they present major problems for the wildlife photographer unless he wants to work with flash bulbs or set gun.

Moose, on the other hand, come regularly to lakes and ponds, bogs and muddy wallows all day long, showing a marked fondness for any open place where wind and mud together will rid them of the tortures inflicted by swarms of black flies, no-see-ums and mosquitoes. This makes a

moose a far easier camera subject than the deer, and accounts for most of the striking moose pictures you have seen.

I recall an occasion in the Lake Superior country that afforded us a chance to photograph a dozen bulls, cows and calves in a single day. Moose were plentiful in that district, and they were spending most of their time, apparently, around the shore of a small, muddy lake. When we came out on the shore we could see three or four young cows, a young and an older bull and

**THE AUTHOR ATTEMPTS TO
FEED TWO VERY HUNGRY
YOUNGSTERS.** *Photo by Ben East*



one cow accompanied by her calf, feeding, swimming or loafing in the water. None of them was within satisfactory camera range, however, so we settled down in a clump of brush to see what would happen.

The first moose to come near were the old cow and her calf. They left off their wallowing and splashing, in water that was shoulder-deep for the cow and must have meant a long period of swimming for the youngster, and started for dry land. They headed our way, the calf swimming strongly in the cow's wake. I waited until it was apparent they were going to land some fifty yards down the beach. Then I slipped back into the shelter of the timber, made a quick stalk to intercept them, and just as the cow was finding bottom with her forefeet I stepped out in plain sight in front of her, camera ready. I half expected she might show fight, since I had caught her flat-footed at not more than thirty feet, with the calf to take into account. But nothing was

farther from her mind. She lunged forward two or three paces toward shore, got firm footing in the muddy sand, wheeled and crashed away in uncurbed panic. While she was still in water two or three feet deep she broke into the long, swinging trot of a moose in a hurry. She fled down the beach for a hundred yards before she turned off into the timber. So far as I could see she did not even look back for the calf. He was doing all right by himself, meanwhile. He plowed ashore after his mother and when she wheeled into the woods he wasn't many yards behind her. They seemed to understand each other perfectly, and maybe that's why she didn't bother to wait for him.

Later that day the young bull wandered in from midlake and started to feed in a bed of lilies where the water reached to his sides. He offered a tempting chance for pictures but he was a quarter-mile down the beach and the cover was hardly thick enough for a stalk. I started

after him without much hope. I took advantage of what brush there was but I was still beyond camera range when I came to a long strip of open shore. I knew that a moose relies first on his nose, second on his ears and almost not at all on his eyes, especially so far as motionless objects are concerned. I decided to try an old trick on this fellow.

I waited until he lowered his head underwater to pull up a bunch of lilies. The instant his ears were submerged I sprinted boldly down the beach. When he showed signs of coming up I checked myself and knelt unmoving behind a low clump of brush. The bull stood for a long minute, munching lily roots, staring straight at me without suspecting I was not part of the scenery. Water streamed down his neck and ran over his glistening, wet shoulders, black mud dripped from the lilies as he chewed contentedly. At last he shook his head vigorously, as if ridding himself of a persistent fly, and ducked his head under once more. Again I raced for him. When he came up that time I had almost reached the spot picked for my camera work. Almost but not quite. There was no brush to screen me now.

I hunched down on the open shore, trying to blend into the trunks of the small cedars behind me, and watched him without moving an eyelash. His head was turned quartering away from me and he finished a lazy snack of aquatic vegetation without changing direction. He went down again and I ran the last twenty yards. When he came up that time, shaking his dripping head ponderously, the camera was on him and ready. I tripped the shutter and at its clatter he swung sharply my way.

His look of outraged astonishment was one of the funniest expressions I have ever seen on a wild animal. So far as he had known, his world was empty of men. Now, without warning, a man was standing at the edge of the lake hardly more than two canoe-lengths from him. He raised his head higher as if trying to confirm what he saw. Suddenly he decided he had seen enough. He was convinced. How I got there he would never know, but the fact of my presence he no longer doubted. He raced away through the shallows, geysers of water spouting around him until he rounded a point and dared to come ashore.



Photo by Ben East

A COW GOES ON THE ALERT, HER SUSPICIONS AROUSED BY A NOISE ON THE SHORE OF THE SMALL LAKE. MOOSE SPEND MUCH OF THE SUMMER IN SUCH PLACES, FEEDING AND SEEKING RELIEF FROM INSECTS.

That afternoon two young cows treated us to a rare spectacle, a brief but lively fracas.

They came down to the shore to feed, one behind the other and a couple of hundred yards apart. They worked their way slowly toward each other, keeping in shoal water not far from shore, and there was no warning of hostilities until they were no more than three times their own length apart. Then the challenge was passed. Whether the ill will was there waiting to erupt, or whether it was born of the moment, fanned by some passing whim of jealousy or resentment, I could not determine. They suddenly lifted their heads, glaring at each other, and laid their ears flat like angry horses. Next they walked toward each other, deliberate and unhurried, in a manner that said as plain as words: "We'll settle this thing here and now and get it over with!"

Meeting, they wasted no time on preliminaries. They upreared, almost as erect as human boxers, and their powerful front legs turned into flails. In such an ill-mannered but effective fashion, apparently, do the females of the moose world settle their disputes.

It didn't last long, hardly more than half a minute. One seemed to get enough. She dropped down, pivoted away and took to her heels.

The only time I have ever actually been charged by a moose, the moose and I were in a stout pole corral together.

The Michigan Department of Conservation undertook extensive live-trapping operations in the Isle Royale National Park about ten years ago, at a time when winter starvation was thinning the big herd there. A number of moose were trapped and transferred to the south shore of Lake Superior, both in an effort to save a few of the animals from hunger and in the hope of establishing a herd on the mainland.

The time was late April. I was working with a state trapping crew that was crating the corraled animals for shipment across the lake. The moose had been trapped during the winter and had lost most of their wildness and fear by now.

We came finally to the last bull, the biggest and least tame of the captive animals. Two or three days of work around the corral had excited and angered him, and the fact that the rest of

the herd was gone and he was left alone made him even more wary and suspicious. He refused flatly to be baited into the trap from which he could be transferred into a stout shipping crate.

It was finally decided that if he would not enter the trap of his own free will he would have to be driven in. Everything was made ready, with two men atop the trap to drop the heavy doors at the right instant. Then five of us climbed through the poles of the corral to make the drive.

We shouted and clapped our hands and the bull fled from us in panic. But he would not go near the trap. It was set in a narrow passageway leading into a second corral, and he avoided that corner as if he understood perfectly what we had in mind. He made three or four wild circles of the corral. Then he slowed down, walked a few steps and stopped. His mind was made up and his whole attitude showed it.

He had stopped directly in front of me. I edged out a few steps from the fence, yelling to spook him into flight again. He refused to budge. I put a clump of birches between him and myself and did a war dance. It had no effect. Finally I stepped around the trees, into the open.

The hair was already standing all across his shoulders. He gave his head one impatient, angry shake, lowered it — and I wheeled and raced for the safety of the fence. I had only four or five paces to go, he had at least twice that far. I went under the bottom pole in a long sliding dive and in that same split second he crashed headlong into the barrier behind me. Twenty-four hours later we gave up and left him in solitary confinement in the pen, to quiet down and be lured into the trap with an offering of food many weeks afterward.

That charge taught me a great deal about the agility and power of an enraged moose. I shall never forget the speed of his arrival at the fence nor the way he smashed into it. I say again, don't take foolhardy chances with a moose that acts irritable. The odds are that he'll give you the right-of-way, but if he shouldn't, don't contest it with him unless you are prepared to force a decision. Don't, in short, underestimate him. He is lord of the northern trails and he knows it. The title carries privileges, and once in a while he sees fit to demand his rights.



HEADKEEPER SCOTT DOSES THE WILDFOWL POND IN THE ZOOLOGICAL PARK WITH A SOLUTION OF COPPER SULFATE, TO COMBAT THE ALGAE THAT FORMS A SCUM ON THE SURFACE DURING THE SUMMER.

BIRD HOUSEKEEPING

UNDER the capable superintendence of the Headkeeper of Birds, George Scott, the largest and most varied bird collection in the country today, flourishes. He is one of General Curator Lee S. Crandall's right hand men.

Even as a young lad, George Scott was interested in birds. He spent many hours after school studying the habits and characteristics of bird-life in his native England.

Scott started working as a keeper in the Bird Department twenty-three years ago this May,

where the earlier hobby of his youth stood him in good stead. When Samuel Stacey retired from his position as Headkeeper of Birds in 1941, it was decided that the most logical man to fill this vacancy was George Scott. So it was in 1941 that Scott took over his new duties as Headkeeper.

He is constantly on the go, for his charges are exhibited all over the Park. Scott lives with his family in an apartment situated near the service yard, where he is available twenty-four hours a day in case any emergency should arise.



MEALWORMS ARE A STAPLE OF DIET FOR MANY OF THE BIRDS AND THE HEADKEEPER SUPERVISES THEIR BREEDING IN THIS RACK OF TRAYS. HUNDREDS OF THOUSANDS OF WORMS ARE USED EACH YEAR.



"BEHIND THE SCENES" IN THE HUMMINGBIRD SECTION OF THE JEWEL ROOM. ATOP THE HABITAT CAGES ARE SMALL SCREENED BOXES INTO WHICH THE BIRDS FLY WHILE THE CAGES ARE BEING CLEANED.



**BEAK OF THE MAGNIFICENT
BIRD MUST BE EVENED-UP**



**WITH A PAIR OF SHARP NIPPERS,
SCOTT SNIPS OFF A TINY BIT**



**ABLE TO EAT AGAIN IN COMFORT
—THE MANDIBLES ARE LINED UP**

**THERE IS ALWAYS EXCITEMENT AND CONFUSION WHEN THE PELICANS ARE FED ON COPE LAKE IN THE
ZOOLOGICAL PARK. THE HEADKEEPER WATCHES THE BEHAVIOR OF SOME NEWLY-ARRIVED SPECIMENS.**





GREAT PET OF THE HEADKEEPER OF BIRDS—AND FOR THAT MATTER, OF THE WHOLE STAFF OF THE BIRD DEPARTMENT—IS "COCKY," A SULFUR-CRESTED COCKATOO FROM NEW GUINEA. COCKY GETS LONELY IN THE BIRD HOUSE, SO SCOTT OFTEN TAKES HIM OUT FOR A VISIT AND SOME HOME COOKING.

An Expedition YOUR FRIENDS Will Wish to Join

By DONALD T. CARLISLE

ONE DAY soon you will receive an invitation to an unusual ceremony. The Belgian Ambassador, Baron Robert Silvercruys, will formally present to the New York Zoological Society three husky young African Elephants — gifts to the Society from the Belgian Congo in recognition of American cooperation during the war.

A little later this fall you will again be invited to another, similar occasion when we hope that Governor General Chang Chun will present to the Society a baby Giant Panda, gift of the Provincial Government of Szechuan, again in token of the essential friendship between this Nation and the Chinese.

Sometime in the spring of next year Society members, it is anticipated, will be bidden to a preview of the Duck-billed Platypuses—never before seen alive outside Australia save in this Park in 1922.

We can't help feeling that there is something significant in the fact that friendly nations throughout the world single out the Society as the proper custodians of these rare animal treasures. It is as though they must recognize our desire and intent to make the Society the greatest center of living natural history ever created.

In the months ahead many other interesting events appear to be more than possible. For instance, via Denmark come four lively polar-bear cubs. There is the decided probability that in the next year we will show Pere David's deer — the rarest deer in the world in the opinion of many,

since there is but one herd extant on the estate of the Duke of Bedford. In Guatemala a group of rare birds is waiting for the settlement of the shipping strike. There is even a chance that it will not be long before we can show you the European Bison or Wisent — a mammal nearly exterminated during the war.

Within the Park plans go merrily ahead for the reception of these new citizens. One event scheduled certainly for early spring will be the opening of the modernized Small Mammal House — a delightful adaptation of our successful Jewel Room of the Bird House to the uses of a wide variety of the smaller but strange and beautiful small mammals of the world.

All these occasions fall into a most entertaining calendar of special events—to which as members we intend to give you special invitation. Each is an episode in the postwar expedition of the Society—the expedition we have promised as soon as conditions warranted. Now things are coming thick and fast. We are away ahead of schedule.

Undoubtedly, many of your friends would like to be present at some or all of these special members' parties.

A booklet about the Society will reach you shortly. Besides going to members it will be sent to a large list of persons who should have an interest in the Society, but who for one or another reason may be presumed not to know as much about us as we would wish. The intention of the booklet is to gain us many new members.

Doubtless you have a number of friends who would be interested in our expedition if they knew about it — friends who are not on our list because no such list can ever be complete. Many youngsters for instance would love to see the new baby Panda, the three kittenish young elephants or the four cavorting polar cubs, on the days when they forsake their shipping crates for their new Park homes. Their names will not be on our list, though we would like to welcome them.

Your Society's officers would greatly appreciate it if you would pass your copy of our new booklet to some one who would be interested. Perhaps you know a boy or girl who would benefit from his or her membership. Possibly you will want extra copies of the booklet to give to friends.

The Zoological Park has been a busy place right along. It is much busier now, and in the

near future more and more things will be happening that will be fascinating to our membership. If you have enjoyed your past association with the Society you may be fully assured that the future holds much more in store for you.

It is appropriate at this moment to thank the many members who have helped us in our campaign. Our rolls have doubled in only a little over a year — thanks in large part to the loyal work of many friends. One member has brought in over fifty more. Several have brought in more than twenty.

But there are still many, many people who would like to join our Expedition with its exciting, fascinating, frequently laughable events ahead.

It is an Expedition your friends will wish to join.

New Members of the New York Zoological Society since the last issue of ANIMAL KINGDOM

Armour, William	Goodman, Herbert S.	Muzelak, Peter
Bamjee, J. Dinshaw	Gorden, Harris A.	Pope, Vernon
Bloom, Julius	Hendricks, Mrs. W. Homer	Portobello, Mrs. Theresa R.
Brady, Mrs. Bertha C.	Koerner, Arthur E.	Richard, John J.
Burt, Clayton R.	Kosby, Miss Ruth	Roth, Mrs. William M.
Carey, Mrs. Andrew Galbraith	Kramer, Mrs. Arthur J.	Schwartz, Haskell
Carriker, Melbourne R., Dr.	Maltz, B. N.	Smull, Mrs. J. Barstow
Darling, Donald M.	Martin, Mrs. Harry P.	Stein, Kenneth E., Dr.
Darrell, Norris	Maverick, Maury	Thiele, John H., Jr.
Dawson, C. Preston	Maxwell, James D., Dr.	Turner, Lewis
Eichenholtz, Robert M.	Maynard, Richard S.	Waldes, Milo
Emerson, Miss Ruth Van Cleve	Menary, Robert V.	White, Miss Gertrude R.
Finch, Charles A.	Meyers, Ralph F.	Zepp, C. P.



MARTHA, THE LAST
KNOWN PASSENGER PI-
GEON, DIED IN THE CIN-
CINNATI ZOOLOGICAL
PARK, SEPTEMBER 1, 1914.

Photo courtesy of Cincinnati Zoological Park

THE LAST OF A SPECIES

By WILLIAM BRIDGES

THE WHOLE WORLD was beginning to take fire on the first day of September, 1914, so it is understandable why the death of a pigeon in the Cincinnati Zoological Garden passed, if not quite unnoticed, at any rate with a minimum of general interest. The Cincinnati *Enquirer* gave it a third of a column; no doubt the wire associations sent a paragraph to other American newspapers. I cannot find that the New York *Times*, usually receptive to significant news, bothered

about the little obituary, for the Battle of the Marne was in the making that September day and the extinction taking place in western Europe transcended, in news value, the extinction of any bird.

Nevertheless, all of us interested in animal life must wish that some editor with a sharpened sense of history — natural history — had assigned a reporter to record every minute detail of the drama that was taking place in Cincinnati, be-

cause the dying pigeon was Martha, the last Passenger Pigeon in the world. The very last of a race, sole relic of flocks comprising uncounted billions of individuals.

It was an opportunity for someone to record an event that may never occur again — the final exit of a species before human eyes. Other forms of wild life will go out of existence; many large and spectacular creatures are almost surely doomed today. But in all probability they will drift from existence into non-existence while no man watches or is aware, just as the Great Auk and the Carolina Parakeet and the Heath Hen disappeared, and we will realize they are gone irretrievably only when the last known individual fails to appear in its accustomed haunts. The stars, the whispering leaves, the bright eyes of some small startled mammal may be the only witnesses of their passing.

Our chance to see a species expire came only with the Passenger Pigeon, for its circumstances were unique. In 1914 it had already vanished as a wild bird, a stealthy and obscure disappearance, but the race had lingered a long time in captivity and the approach of its doom could be seen and measured and recorded. For once, we could know to the hour and minute when a great phase of American life came to an end.

But much as we regret it now, no reporter kept a death-watch beside Martha's cage and sought out all the ascertainable facts of her life, and as things stand, the published and scattered accounts are confused and conflicting. After the lapse of only thirty-one years and while the guardians of her last hours are still alive, it has been difficult to reconstruct accurately and in detail the story of her end and her apotheosis.

In running down as much of the story as is still recoverable, I have had the cordial assistance of Director Joseph A. Stephan of the Cincinnati Zoological Garden, of his father, General Manager Emeritus Sol A. Stephan, and of Dr. Herbert Friedmann, Curator of Birds of the U. S. National Museum.

To set the stage for the exit of Martha, it is necessary to recall what the Passenger Pigeon was, and something about its natural history. A whole generation has grown up since the last captive bird died and the wild birds had disappeared more than a generation before 1914,

so that there are many grown men and women today who never heard of the Passenger Pigeon. Mention it, and they think of the Carrier Pigeon or the Homing Pigeon.

The Passenger Pigeon, despite its name, did not carry messages nor did it have a highly developed homing instinct. It was something entirely different from the specialized breeds of the common domestic pigeon; it was a true wild pigeon, native only to North America. Slender-tailed, bluish, with a slaty-blue head and breast of purplish-brownish-red, it was big and handsome. It had a wingspread of almost two feet and it weighed about 12 ounces.

The "Passenger Pigeon," it was called, presumably because it was constantly wandering over areas of several hundred square miles in search of food, or making sun-darkening flocks to its roosting or nesting grounds. In the early years of the last century the wild pigeon flocks roamed almost the whole of the United States where the hardwood forests existed, and they consumed unbelievable quantities of acorns, beechnuts, chestnuts and other tree seeds, of blueberries, huckleberries, raspberries, wild cherries, pokeberries and even caterpillars and other insects.

In 1832 the conservative ornithologist Alexander Wilson estimated that a single flock he encountered near Frankfort, Kentucky, contained *at least* 2,230,270,000 birds. Audubon cited equally prodigious flocks. Wilson's birds, if they ate only one pint of beech mast each in the course of a day, would consume 34,847,968 bushels a day.

Their nesting sites in Kentucky, Indiana, Michigan and elsewhere in the Middle West have been described by competent naturalists in the early and middle years of the last century. Millions of pigeons nested in the same forest. Over an area of a hundred square miles every tree would be loaded with nests, often as many as a hundred in a single tree. Great branches would break from the weight of the nesting birds.

Concentrated as they were in flocks, roosts and nests, their extermination was easy. Netters could take 3,000 birds at the spring of a single trap. The methods of slaughter, for market or for sport, were many and varied and often cruel and wanton. By the "Seventies" the vast flocks were

gone from many parts of the country and by the "Eighties" the end was in sight everywhere.

In 1879 dead Passenger Pigeons were selling for 35 to 40 cents a dozen at the nesting sites, 50 to 60 cents a dozen on the Chicago market. Live birds that could be fattened and fed up for increased tenderness were worth \$1 to \$2 a dozen.

Already voices were crying in the wilderness, warning that the Passenger Pigeon was not an inexhaustible resource. In 1878 or 1879 (the record is confused), the Cincinnati Zoological Society bought four pairs of live Passenger Pigeons near Petoskey, Michigan, and paid the (comparatively) exorbitant price of \$2.50 a pair. These were put on exhibition in the Zoo and were, it appears, the progenitors of the last, ultimate survivor of their race.

As I said before, I wish some trained reporter had nominated himself Historian to the Last Passenger Pigeon, for the printed records are sadly in conflict. Edward Howe Forbush, the notable ornithologist of "The Birds of Massachusetts," thought the sole survivor in the Cincinnati Zoo had come (as I read his rather ambiguous remarks), from the Whittaker flock in Milwaukee.¹ Ruthven Deane attributed the last bird to the Whitman flock in Chicago (*The Auk*, 1911, page 262) — and, incidentally, stated that she was "about fourteen years old" then (1911). All the Cincinnati Zoo sources I have seen indicate that Martha was 29 years old at the time of her death.

(On second thought, maybe it would have been better to have had *two* trained reporters keeping the history of Martha — each one checking on the other!)

The moot point of Martha's age (29 years is a remarkably advanced age for a pigeon), probably depends on whether one believes she came from some late generation of the Whittaker-Whitman flocks, or whether one accepts the

¹ "Now for the last living Passenger Pigeon of which we have any information. David Whittaker, of Milwaukee, Wisconsin, procured a pair of young birds from an Indian in northeastern Wisconsin in 1888. During the eight succeeding years, fifteen birds were bred from this pair, six males and nine females. A part of this flock finally went to Professor C. O. Whitman, of Chicago University. In 1904 Professor Whitman had ten birds but his flock, weakened by confinement and inbreeding, gradually decreased in number. The original Whittaker flock decreased also, and in 1908 there were but seven left. All of these died but one female, which was sent to the Cincinnati Zoological Society. At that time the society had a male about twenty-four years of age, which has died since. The female in Cincinnati, so far as I know, is living still, and in all probability is the last Passenger Pigeon in existence."—E. H. Forbush, "The Last Passenger Pigeon," *Bird-Lore*, Vol. 15, No. 2, March-April, 1913. Pp. 99-103.

Stephan family version of her origin — for both Director Joseph Stephan and his father have repeatedly and positively asserted that Martha was a direct descendant of the Cincinnati Zoo's own birds, that she was hatched in the collection, and passed her whole life within the confines of the Zoo.

The conflicting evidence extends even to the time of her death — some accounts saying 1 o'clock in the morning, some 1 o'clock in the afternoon. It has even been said that Martha died on September 2 instead of September 1.

Unable to reconcile all these contradictory statements, I wrote to Director Stephan and by return post came a sheaf of longhand and type-written notes that his father had compiled around the time of Martha's demise. They, I thought, would settle matters once and for all. Instead, they offered some new contradictions!

Once more I queried the amiable Director of the Cincinnati Zoo, and his reply (airmail, special delivery), was as specific as anyone could wish. He had even, I noticed, put a new and boldly black ribbon on his typewriter. There could be no question of illegibility.

"Martha died," he wrote, "at 5:00 P. M. September 1, 1914. My father, Sol A. Stephan, Director of Animals, now 96 years old, and myself were with her at death, as she was very feeble and had to be assisted to eat.

"Martha was hatched at the Cincinnati Zoo with many others, but outlived her sisters and brothers. She was named after Martha Washington. We still have the aviary covered with the same wire, that caged all the Passenger Pigeons and also have a sign erected to indicate that. Of course these birds were outdoors 12 months a year, with protection from the strong winds.

"I as a boy would take the eggs that dropped out of nests and put them under tame pigeons to hatch in my pigeon loft. Sometimes when they were about to hatch I put them in a Passenger Pigeon nest to let them finish the incubation, and when hatched, they mothered them O. K.

"On Sundays we would rope off the cage to keep the public from throwing sand at her to make her walk around; during her last five or six months she was not able to fly up to her perch."

So much for the time and date of Martha's

death. I know of no one better qualified than Director Stephan and his father to say exactly when it occurred.

The United States Weather Bureau tells me that September 1, 1914, was a partly cloudy day in Cincinnati, with no rain but a fairly high humidity of 74 per cent. and a temperature range of 72 to 89 degrees. A warm, rather muggy day, it would appear, typical of so many midwestern summer days. The problem of what to do with Martha's body — long since promised to the Smithsonian Institution — must have required an immediate answer. I had seen a statement somewhere (which Dr. Friedmann of the Smithsonian had been unable to confirm), that she was frozen in a block of ice for shipment to Washington.

Director Stephan was positive about that:

"I took her to the Cincinnati Ice Co. plant personally and supervised the placing of her body in a tank of water, suspended by her two legs, and froze her body into a 300-lb. block of ice," he wrote me.

Martha's body reached the United States National Museum on the morning of September 4, and the experts — taxidermists and anatomists — immediately went to work on it. A full account of the anatomical work was subsequently published (with a ghastly plate of the skinned carcass), in *The Auk* (1915, page 29), by Dr. Robert Wilson Shufeldt, sometime Honorary Curator of the Smithsonian Institution and in 1914 an associate in zoology.

"I found," he wrote, "the bird to be an adult female in the moult, with a few pin feathers in sight, and some of the middle tail feathers, including the long, central ones, missing. . . . It had the appearance of a specimen in good health, with healthy eyes, eye-lids, nostrils, and

mouthparts. The feet were of a deep, flesh-colored pink, clean and healthy, while the claws presented no evidences indicative of unusual age, though not a few of wear."

Eventually the anatomists and the taxidermists did their work and Martha was ready to be presented to posterity that would never see her kind again in the flesh.

"This specimen is still on exhibition in the U. S. National Museum," Dr. Friedmann wrote. "The bird is mounted perched on a branch of a tree which, in turn, is inserted in an old-fashioned mahogany stand. The specimen is shown in our synoptic series of North American birds with no special trimmings. There is no background and the bird is not in a case by itself. The case is one of those which has glass on both sides and consequently there are two labels, one on either side of the bird. These labels read as follows:

Ectopistes migratorius (Linnaeus)
Passenger Pigeon.

Exterminated. Formerly very abundant throughout a large part of North America. This is the last known individual. It died in captivity in September, 1914.

Ectopistes migratorius (Linnaeus)
Passenger Pigeon.

Last of its race. Died at Cincinnati Zoological Garden, September 1st, 1914.
Age 29 years.

Presented by the Cincinnati Zoological Garden to the National Museum.
Adult female, 236650.

Such are the few stray bits of information that may now be gleaned about Martha's life and death. Thirty years ago a historian could have garnered other, and more pertinent, facts. I wish he had — but I wish even more that the grandparents of the present generation had not thought the Passenger Pigeon was indestructible.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

Orchids for the Park!

This letter of commendation, reproduced below, is direct testimony of the fine job being done by our employees and a feather in the cap of the Zoological Park.

"I spent today (Labor Day) at the Bronx Zoo with my two little boys. Altho I have lived nearly all my life in the Bronx and have always been a frequent visitor I must say I cannot remember bigger crowds than were present today. Neither can I remember a more pleasant day. In this day when pleasant experiences are not the usual thing the courtesy of your employees, the thought and foresightedness of yourselves in caring for all these people is little short of a miracle. The Children's Zoo, the stands and the coffee houses are such an enjoyable experience, reasonable in price, and I can't imagine how you have managed to keep all of your employees in every capacity so friendly and helpful.

"When the day comes that I can afford it, I will join your society as I feel that any society that handles people as I saw people handled today is really doing a public service. I really think that a small entrance charge should be exacted at all times as this is really too much to receive for no charge.

"Thank you again for a very happy day. I cannot enumerate the pleasures I have experienced this day."

Over Forty-six Years of Service

After forty-six-and-a-half years of faithful service in the New York Zoological Park, George Skene, retired on July first. During these many years, he worked successively as Gardener, Head Gardener and finally as General Foreman of Maintenance.

George Skene first came to work in the Zoological Park on New Years day in 1904. Through these many years of service he has

watched the Park grow and progress to the world-famed institution it is today.

We have asked Mr. Skene to write the story of his years of service for a coming issue of *ANIMAL KINGDOM*. This article should be an exciting history of the many changes and improvements that have evolved through the years.

A New Arrival

Nature sometimes goes haywire to create something out-of-this-world, yet in it; something suggestive of a nightmare character, a fantastic dream-child. This thought occurred to visitors at the Reptile House when they saw on display five Whip Scorpions recently received from Texas. They are native to southern United States and locally known as Grampuses or Vinegar Roans.

Superficially they resemble true scorpions, which themselves are whimsical. But Whip Scorpions have no poison spike at the end of the tail. Instead their three-inch body terminates in a segmented, bristle-like appendage which can



THE VINEGAR ROAN IS SUITABLY NAMED,
FOR IT EMITS A DECIDED VINEGAR ODOR.

neither sting nor lash. Often it is held as if to threaten an aerial opponent, or horizontal to guard against a surprise from the rear. Of the four pairs of legs, the front pair is twice as long as the others and modified to serve as feelers. They reach out in front of the head, tapping the ground like a blind man's cane to be advised of the contour. This in spite of the fact that a Whip Scorpion is equipped with eight simple eyes.

Attached forward of the feelers, yet not out-reaching them, is a pair of stout, segmented pedipalps that curve inward toward the mouth. Each segment is armed on the inside with short, horny teeth and the last two segments form a pincer-like claw suggesting that of a fiddler crab or a crawfish. Live food such as insects or spiders are seized with the claws and carried to the toothed margins of the pedipalps, and to a pair of hooked head appendages known as chelicerae, for crushing. The blood of the victim is then sucked into the victor's stomach to serve as nourishment.

Alarm a Whip Scorpion and you will soon realize why it is called a Vinegar Roan. It is roan colored and can emit a decided vinegar odor. The creatures are found in dry, sandy places — under bark, boards, and other objects; but being nocturnal they are quick to bury themselves when discovered. — BRAYTON EDDY

* * *

Dr. William Beebe and the staff of the New York Zoological Society's Department of Tropical Research have returned to the Zoological Park after spending seven months studying the jungle life in the Society's field station at Rancho Grande, Venezuela. This was the forty-sixth scientific expedition of the department, and the second to Rancho Grande.

"Junior," Our Young Gibbon, is Progressing!

Gibbon Island draws many visitors daily who delight in watching a lively family of three White-handed Gibbons swinging through the trees and the growing-up antics of the youngest member of this threesome — "Junior."

One of the Island's trees, weakened because of its nearness to the lake, was strengthened by a steel cable run from its trunk to the far side of the island. This cable was taken over by the parent Gibbons, who walk it much as tight-rope

artists would or travel it hand-over-hand, to and from the ground.

It is on this wire that Junior has advanced to another stage of his learning, as he tries to follow the example set by his parents. Junior's earnest but clumsy attempts, as he swings his small body and desperately throws one hand after the other, are a comically sharp contrast to the graceful, effortless ease of the parents' gymnastics on this wire. If Junior isn't quite able to make the entire distance the mother is always nearby to lend a helping hand.

* * *

Mr. Osborn attended the Roscoe B. Jackson Memorial Laboratory Conference on Genetics and Behaviorism which was held at Bar Harbor, Maine, on September the twelfth and thirteenth.

* * *

James Simon took over his duties as Director of the Jackson Hole Wildlife Park on the twentieth of September.

A Book Report

MAMMALS OF NEVADA, by E. Raymond Hall, 710 —XI pp., 21 illustrations from photographs, 485 text figures, 81 distributional maps. University of California Press, Berkeley and Los Angeles, 1946. \$7.50.

"Mammals of Nevada" is not a book for the casual reader but it definitely is one for the searcher for information concerning the western mammals, especially those that invade Nevada. The 232 kinds of mammals known to exist there are treated with a thoroughness unlikely to be excelled in our time.

A rather curious solution has been found for the vexing problem of common names for the sometimes numerous subspecies of a given species. Dr. Hall has cut the Gordian knot by deciding that the common name of a species must do for all its subspecies. But when the reader finds that an even twenty forms of *Thomomys bottae* are all called the Botta Pocket Gopher, he seems likely to wonder if the solution really is satisfactory.

The compilation of such a work is a Herculean task, covering many years and Dr. Hall and his numerous associates in the work are to be congratulated on its successful conclusion.

— LEE S. CRANDALL

ANIMAL KINGDOM



THE MAGAZINE OF
THE NEW YORK ZOOLOGICAL SOCIETY

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York 20, N. Y.

PRESIDENT
Fairfield Osborn

FIRST VICE-PRESIDENT
Alfred Ely

SECOND VICE-PRESIDENT
Laurance S. Rockefeller

SECRETARY
Harold J. O'Connell

TREASURER
Cornelius R. Agnew

EXECUTIVE COMMITTEE
Laurance S. Rockefeller, *Chairman*

Cornelius R. Agnew
Alfred Ely
De Forest Grant

Warren Kinney
William De Forest Manice

David H. McAlpin
Robert Moses

Harold J. O'Connell
Fairfield Osborn
J. Watson Webb

BOARD OF TRUSTEES

Class of 1947

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez

De Forest Grant
Eugene Holman
Warren Kinney

Henry R. Luce
William De Forest Manice
Harold J. O'Connell

Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1948

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely

Marshall Field
Childs Frick

Archer M. Huntington
David H. McAlpin

John H. H. Phipps
Clendenin J. Ryan
Harrison Williams

Class of 1949

George C. Clark
F. Trubee Davison

Jay Downer
Robert I. Gannon

Robert Gordon McKay
Fairfield Osborn

Laurance S. Rockefeller
John M. Schiff
Frederic C. Walcott

Ex-Officio, The City of New York

The Mayor, Hon. William O'Dwyer

Commissioner of Parks, Hon. Robert Moses

STAFF

GENERAL

John Tee-Van *Executive Secretary*
Jean Delacour *Technical Advisor* Herbert F. Schiemann *Comptroller*
William Bridges . . . *Editor & Curator, Publications* Sam Dunton *Photographer*
Myrtice A. Blatchley . . . *Associate in Charge, Department of Education*

ZOOLOGICAL PARK

Lee S. Crandall *General Curator*
Brayton Eddy . . . *Curator of Reptiles & Insects* Leonard J. Goss *Veterinarian*
Edward Kearney . . . *Manager, Facilities Dept.* Grace Davall . . . *Assistant to General Curator*
Quentin Melling Schubert, *Superintendent, Construction and Maintenance*
W. Reid Blair *Director Emeritus* William Beebe *Honorary Curator, Birds*

AQUARIUM

Christopher W. Coates . . *Curator and Aquarist* C. M. Breder, Jr. . *Research Associate in Ichthyology*
Ross F. Nigrelli *Pathologist* George M. Smith . *Research Associate in Pathology*
Myron Gordon *Assistant Curator* Homer W. Smith . *Research Associate in Physiology*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*

Jocelyn Crane *Research Zoologist* Henry Fleming *Entomologist*

Associates

William K. Gregory
John Tee-Van

Gloria Hollister
Mary VanderPyl

SCIENTIFIC ADVISORY COUNCIL

A. Raymond Dochez
Alfred E. Emerson

Alan Gregg
K. S. Lashley

John S. Nicholas
George M. Smith

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

VOL. XLIX

DECEMBER 16, 1946

No. 6

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York 20, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York 60, N. Y. Title registered with United States Patent Office.

Subscription, \$2.50 a year; single copy, 50 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

Opportunities Are Increasing in Research

THE OPPORTUNITIES that present themselves to our Society for the extension of work in various fields of biological research are constantly increasing. The old adage comes to mind, "One thing leads to another." At the present time staff members are engaged in a number of specific research programs — in neuro-physiology, parasitology, genetics, virus and bacterial diseases, and in the study of pigment cells and their relationship to cancer. Rich and varied studies are being carried on at Rancho Grande in Venezuela by the Department of Tropical Research. The three laboratories at the Zoological Park are continually supplying data and material to research centers in hospitals, universities and other laboratories. It is satisfactory to realize to how large a degree all of this work, so varied in character, has a bearing directly and indirectly upon human welfare.

There is still a major gap. We should be doing a concentrated job in the study of animal behavior and psychology. One of the country's leading psychiatrists recently stated that the new and increasingly important science of psychiatry is in great need of a basic structure of knowledge that can be gained only from an understanding of the instincts and psychology of forms of life other than human beings. In the building of such a structure of knowledge the Zoological Society has an opportunity that can prove of far-reaching consequences. Our institution is obviously especially well equipped to enter such a field of research because of the extensive and varied collections of animals in the Zoological Park and also because of the availability of field stations such as those in Jackson Hole, Wyoming, in Venezuela, and those which we may establish in other parts of the world. The members and friends of the Society will be interested to know that we are directing our energies to the development of a long-term research program in this important area of study.

Fairfield Osborn

IN THIS ISSUE

Marsupial Frog	Sam Dunton	COVER
Trustees of Friendship	Donald T. Carlisle	191
The Great Gray Frog of Rancho Grande	William Beebe	193
How to Weigh a Gorilla	William Bridges	200
Fish Do Come Back	Ben East	204
42½ Years of Gardening in the Zoological Park	George Skene	211
Behind the Scenes: News and Notes		217
Index to Volume XLIX		219



Photo Courtesy Holiday Magazine

WHILE GOVERNOR GENERAL RYCKMANS OF THE BELGIAN CONGO MADE THE SPEECH OF PRESENTATION, OUR THREE YOUNG ELEPHANTS TOSSED DUST ON THEMSELVES AND ENJOYED A HOLIDAY.

Trustees of Friendship

By DONALD T. CARLISLE

UNDER A BRIGHT NOVEMBER SKY, tossing their hay and stretching their juvenile trunks for buns, three little African elephants — Zangelima, Bamangwa and Doruma — became the property of the children of the United States "in the trusteeship of the New York Zoological Society" at a special ceremony at the Zoological Park on November 13.

Presentation of the elephants was made by Governor General Pierre Ryckmans of the Belgian Congo in a delightful and witty speech stressing the great friendship of Belgium for the United States because of our cooperation with the Congo during the war years. Mr. Fairfield Osborn, as President of the Society, made the speech of acceptance in which he emphasized the great work for conservation which has been taking place in the Congo. Mr. Osborn also read a message of welcome from Commissioner of Parks Robert Moses who was unable to attend. Also on the speakers' platform, which was gaily decked with the flags of the United States, Belgium and the Belgian Congo, were Mr. Paul-Henri Spaak, Belgian Minister of Foreign Affairs and President of the United Nations General Assembly, and His Excellency Baron Silvercruys, Belgian Ambassador to the United States.

In the audience of some 150 Society members and friends were Mr. Fernand van Langenhove, Secretary General of Foreign Affairs for Belgium, and Mr. Joseph Jennen to whom the Society is greatly indebted for his help in arranging the details incident to this magnificent gift — perhaps the greatest in the Society's history. Unfortunately absent due to illness were Mr. Laurance S. Rockefeller, Chairman of the Society's Executive Committee, who has taken a great interest in the elephants; Mr. Walter Loridan, Chief of Cabinet of the Belgian Minister of Foreign Affairs; and

Mr. Charles Hallaert, Consul General of Belgium in New York.

Following the presentation ceremony which took place outside the south door of the Elephant House, the guests of honor inspected the other residents of that building and toured the Lion House, including Mrs. Martini's nursery, and the Jewel Room of the Bird House on their way to the Administration Building. Here a buffet luncheon was served for guests and members followed by a tractor-train safari through the Park with special stops at the main points of interest, particular attention being paid the Okapi, another Congo resident, and Doreen, the Bongo antelope — these two animals being the first of their species ever to visit the United States.

In the opinion of many old-timers present, the Society has never held a gayer or more significant party.

"Most Appropriate of Gifts"

In presenting the elephants to the Society, Governor General Ryckmans said:

"The United States and the Belgian Congo became great friends during the war. We did our best to supply you with badly needed raw materials and you provided us with all we needed to live and work and fight. So, we got to know each other better and we took a liking to each other, and when peace came and we could enjoy once more the amenities of civilized life, we planned to make you a little present, just for friendship's sake. But a suitable present is not an easy choice. It should be something your friend can't go and get for himself at the corner store. If you're clever, you'll make it something that will remind him forcibly of you, that couldn't possibly be the present of his wife's cousin, or his business partner! Then it should be something

nice and tidy . . . not too bulky, not too cumbersome. Well, elephants! The very thing; the ideal present! So when we heard the Bronx Zoo was short of elephants, we just sent you these three little pets.

"Judging from your acknowledgment, it would seem that our choice was indeed a happy one. But don't let us make any mistake about this matter. I must tell you that this gift was not meant for you. I hear quite a lot these days in Lake Success about trusteeship. Well, sir, you are just trustees and nothing more! As a token of friendship from the Belgian Congo to the people of America, this gift was meant for the children of New York. Children all the world over have a fondness for elephants. Elephants, I understand, are a long-lived breed and the Bronx Zoo certainly is a most competent body to take care of elephants, so we may hope that they've come to stay and that your children and, some 25 or 30 years hence, when these elephant kiddies will be about full-grown, your children's children — and around the year 2000 when the elephants will be getting along toward middle age, your grandchildren's children — will think of us when visiting the zoo; that for many, many years to come, many thousands of your dearest will delight in our friendly gift."

"A Lasting Gift"

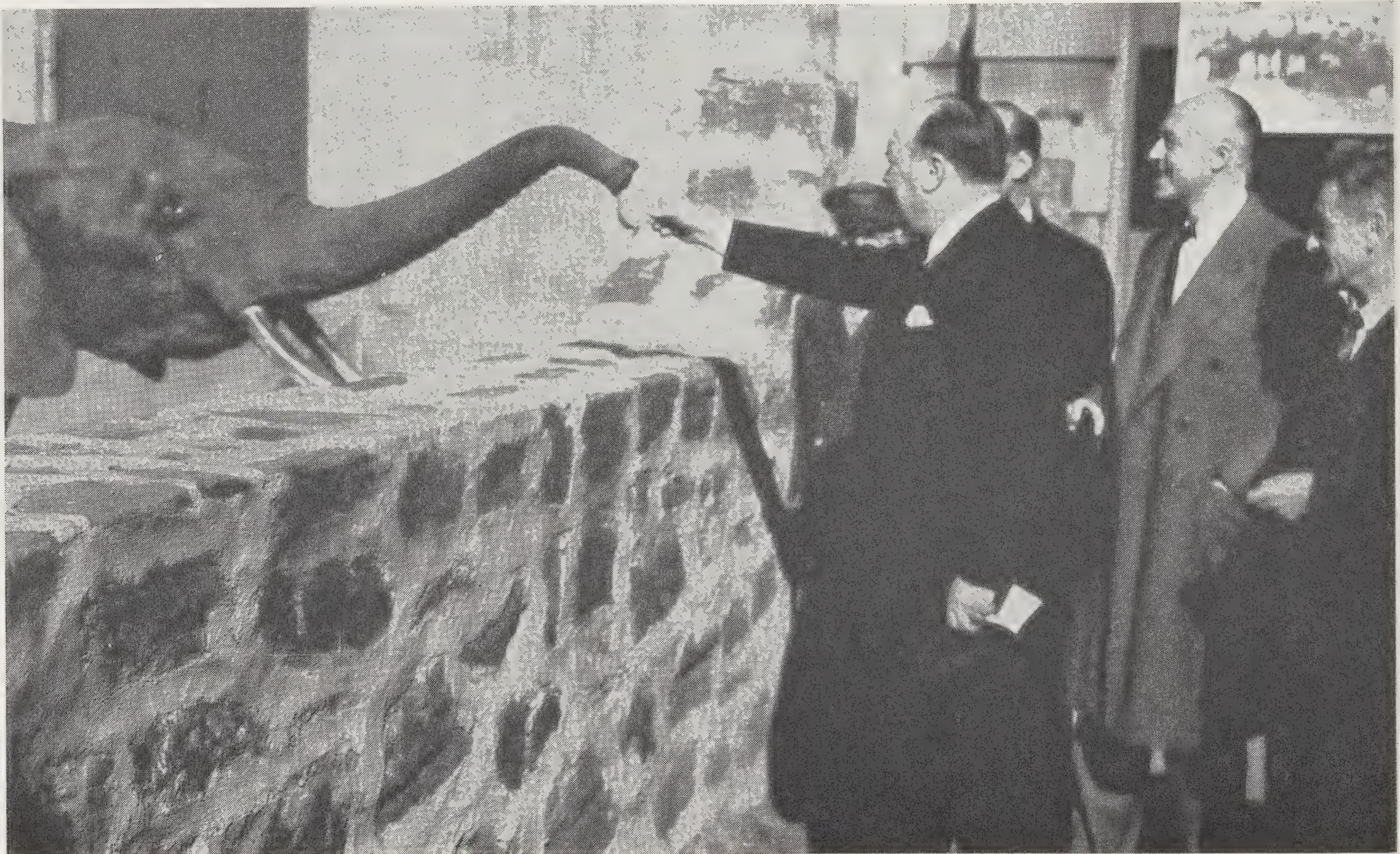
In accepting the elephants Mr. Osborn said:

"This is a very wonderful day. We think it's a big day despite the fact that Governor Ryckmans thinks he's given us a small present. We are tremendously happy to have these wonderful animals here. You've provided us, it so happens, with the only bull African elephant in America, and there he is standing before you.

"Talking about children and children's children, it's a safe estimate to tell you that before these three elephants reach maturity (and Heaven help they have a beautiful, long and happy life), they will be viewed by not less than twenty-five millions of persons. I am making a simple computation of our annual attendance multiplied by about ten years, and if they reach the ripe and glorious old age that Governor Ryckmans suggests, and which we pray for, they will undoubtedly be viewed by the better part of a hundred million persons! So you see you have given a lasting gift to us as trustees for the people of America and for the people from all over the world who come to this park.

"I would be very remiss if I did not take this

(Continued on Page 214)



DR. PAUL-HENRI SPAAK WAS UNABLE TO RESIST THE APPEAL OF ZANGELIMA AND IN COMPANY WITH BARON SILVERCRUYS AND GOVERNOR RYCKMANS HE HELD OUT BREAD TO THE ELEPHANTS.



PERCHED ON TOP OF ITS MOTHER'S HEAD, THE NEWLY-HATCHED MARSUPIAL FROG OBVIOUSLY CONSIDERS ITS MOTHER MERELY A CONVENIENT SPRINGBOARD FOR A LEAP INTO THE WIDE WORLD.

The Great Gray Frog of Rancho Grande

By WILLIAM BEEBE

ON THE EIGHTEENTH DAY of April I stood on the rounded saddle at the summit of the Pass of Portochuelo. One hundred yards behind me, to the south, was Rancho Grande, and beyond stretched the steep valley of the Limon River, leading the eye down to the distant island-dotted waters of Lake Valencia. Beyond all, the horizon was filled with mountain contours hiding the vast plains of the llanos and the upper reaches of the Orinoco River. Before me lay the deep gorge whose mountain torrents flowed into the Caribbean Sea eight miles to the north.

I chose to turn north this morning and after three steps, slipped and slithered down the steep slope to the bottom of the first descent. As I sat up, a great frog hopped out of the jungle into

my lap. It looked huge and very black and as I grasped it I thought it was my old friend, a marine toad. But its toes stuck to me, and it uttered a sudden choking scream which almost made me drop it. After this unfroglie outburst it settled into quiet acceptance of whatever amphibian destiny might bring, a reaction characteristic of most great frogs. It was something wholly new to me and most certainly not a toad.

This was my first informal introduction to the Great Gray Marsupial Frog. The second meeting had certain elements in common and occurred within the walls of our medieval fortress, Rancho Grande itself. We were shifting a great sheet of glass and as one edge was lowered gently to the floor a shrill cry came from my very feet. I looked



AMONG THE GIANT
TREES AND THE
TANGLE OF VINES
IN THE JUNGLE
AROUND RANCHO
GRANDE, THE GRAY
MARSUPIAL FROGS
WERE FOUND BY
D R. B E E B E.

down and saw a large frog clawing the air. It was inflated almost to tennis ball size and two of its toes were caught beneath the glass. When they were freed the frog gave another sharp screech, deflated with a low hiss and leaped up to my sleeve. Here it clung tightly, and as I looked, its two great eyes revolved into view, heaving up from what looked like the depths of its throat, into twin rounded turrets. I presented my hand and with the fearlessness peculiar to

large tree-toads it left its tweed perch and crept clammily onto my fingers.

Twice in former years I have heard similar terrifying screams from amphibians, once an appalling outcry from one which had been caught by an owl. I can compare it with nothing but the corresponding piercing cry of a horse in dire physical agony. In both cases the utterance is wholly unlike the normal voice of the animals.

In the laboratory these two frogs were given

a well equipped home in a large terrarium, with a little pool, a mossy floor and a log. Every evening they were provided with a small flock of moths. In the course of time they were joined by three equally large sisters, and for months all lived the placid, goggle-eyed existence of these pleasant persons of the jungle. Ultimately two of the frogs were successfully flown the more than two thousand miles north to a new home in the Zoological Park.

The life histories of our northern frogs is common gossip in every kindergarten. Like hibernating bats and bears the frogs thaw out in early spring, but unlike the creatures of fur the lowly, cold-blooded folk of our marshes burst at once into song, each with his own refrain, tenor or bass, solo or chorus. Yards upon yards of eggs are unwound into swamps or ponds, and from them wriggle forth one of the greatest miracles of our countryside, living affirmations of fishy ancestors, complete with fins, tails and gills, changing in a

few weeks, before our very eyes, into full-lunged, terrestrial, carnivorous quadrupeds. The little actors in this cosmic drama, give visible, contemporary performances, each spring telescoping for our seasonal benefit the patient rehearsals of past millions of years.

These diminutive, wriggling toad-heads — as we call them when we say polliwogs or tadpoles — could not exist for a moment at Rancho Grande. Water there is in abundance, both suspended as dense fog or pouring down in torrents, but it either sinks into the sodden, mossy jungle floor or sluices headlong down the steep slopes in raging mountain torrents. There is not a puddle, or swamp or pond anywhere. Gravity, in all this tropical, half-mile upland, is polliwogs' nemesis. Yet here were our giant gray frogs, full-grown as if spawned, spontaneously generated by some mythological dragons-teeth.

As time went on we realized that we were too late for the overture or even the first act of the



ONE OF THE GREAT GRAY FROGS IN ITS BED OF MOSS IN DR. BEEBE'S LABORATORY, BEFORE THE HATCHING OF HER BABIES. WHEN HATCHING STARTS, THE CREASE IN THE BACK "UNZIPS."



HERE THE PROCESS OF BIRTH — OR HATCHING — HAS STARTED, AND THE BABIES HAVE BEGUN TO EMERGE FROM THE MOTHER'S BACK. NOTICE HOW THE SKIN HAS SPLIT ABOUT HALF-WAY UP.

mystery. All of our frogs were females, amphibious Amazons with no signs of eggs, tadpoles or mates.

There came a time when we had seven of these great frogs living, sleeping, eating and bathing happily together, each with distinctive hues and patterns. The ground color was changeable from blackish-brown to pale vinaceous buff. Almost always there was a band of dark between the eyes, a great X on mid-back with a broad-arrow behind. When the long, muscular hind legs were folded in the usual three-ply squat, they were as inconspicuous as the rest of the head and body, but when extended as in leaping or held straight by force, hidden glories were disclosed, great wedge-shaped slashes of rich chocolate brown set against golden yellow. This only piled mystery upon mystery for we have no idea why in so many of somber, cold-blooded beings such wonderfully brilliant pigments are revealed only by force or death. Equally inexplicable is the marvel of the eye, an exquisite mosaic of sheer shining gold, shot with a multitude of veins of black lightning. Still another puzzle is the covering of the head of these frogs. Instead of cool soft skin

this is solid bone, diversified by toothed ridges and jagged transverse hillocks, which must make the amphibian a most uncomfortable mouthful for any hungry serpent.

During the day each frog had her favorite place, some definite corner, a deep-sunk form in the moss or under the log. Here they rested, eyes closed to merest slits, completely motionless except for gently throbbing throats. An interruption of this inertia gave us our first clue. One day I was watching a frog, immobile as a carven image, when I saw a quiver pass across the back, a subdermal ripple like the muscular flicker beneath the skin of a fly-troubled horse. It passed and returned, and was then repeated on the back of a second frog. The secret was out and we knew that our pets were marsupial mothers.

The very next day a friendly but heavy-handed road-mender brought us a sorely wounded frog. I killed it at once and found that all the area beneath the skin of the lower back was egg-repository, birthplace, incubator, womb, cradle and nursery in one. The opening to the outer world was a longitudinal median slit along the back from half-way down to the end of the body. This



HATCHING IS COMPLETED AND THE FROGLETS ARE HOPPING AROUND AND ON THEIR MOTHER. THE SEAM IN HER BACK IS STILL OPEN, BUT IN A FEW DAYS IT CLOSED AND COMPLETELY DISAPPEARED.

had been roughly torn open and revealed a mass of premature young. Long after the painless death of the parent these little beings wriggled vigorously about. They were more than tadpoles and less than frogs, still possessing a mumbling polliwog mouth and an extensive finned tail.

Less than six miles away down our mountain road were ditches filled with wriggling tadpoles. Here, Nature had provided each tad with a circular, diminutive pool of its very own, within its mother's body in which it conscientiously went through a fin and gill state with never a chance of straightening out and swimming off. Among other adaptations to this watery isolationism were the gills, grown into great white sheets of tissue completely enfolding the embryo.

About half of the infant frog consisted of a ball of golden yellow yolk, giving to each the appearance of an extremely stout personality. The position of the arms and hands upon this exaggerated tummy was so human that, for a time, they distracted our attention from more scientific matters. In the first pollifrog they were folded exactly as in one of Raphael's cherubs, a second had the palms pressed together as in prayer; both

palms, in a third, were stretched out in front as if to fend off or deny something. Finally the last of the quartet had one arm hanging down and the other straight up with palm out precisely as a policeman halts traffic. This brood would have been an unusually large one, for in one-half of the nursery there were twenty-six potential gray frogs.

As days and weeks passed Miss Crane and I lost much sleep and endured many false alarms in our eagerness to witness and photograph the hatching of the frogs. Ultimately we were present at four exciting accouchements, with divided emotions at the wonder of it all and the humorous and dramatic aspects. A brief account of the experience of our favorite parent must suffice for all.

On the morning of May the first a single newborn froglet was found on the moss of a small terrarium with its parent. This brought us down to the laboratory every two hours for several nights, but it proved a false alarm and nothing more happened. It seemed as if it must have been an advance scout of sorts, like Kim's soldier who "went before to make all ready." Then we

were completely fooled by another matron. At nine o'clock one night not a link in her dermal zipper had started, yet at six next morning the moss was covered with two score bright-eyed youngsters.

A week later our favorite was taken with a seizure. She bowed her head and now and then heaved and strained. Yet another week passed with still no results, and we surmised that it must have been "Sumphin she 'et."

Early on May seventeenth our mother's back seemed bulging to the limit of endurance, and the base of the seam revealed signs of ripping. Careful watching at dawn showed gentle heaves and billowings underneath the skin. At three in the afternoon the breach gave a bit more, and in the oblong opening there appeared a diminutive face. Impetus applied from behind pushed him farther out and two little arms and hands spread themselves on the white tissue of his mother's hem. He looked as the Frog Footman must have looked when very much off duty, tucked in bed with the blanket pulled well up.

We gently moved the great frog to the center of the photographic table and waited. She was restless, as what mother under the circumstances would not be, with twenty to forty diminutive images of herself waiting impatiently for freedom. She would sit quietly for a time and then as her crèche rocked and swayed, she would pop out her eyes and begin slowly to creep away. The barrier of my hand she took as a challenge. After several futile pushes with her bony skull and an array of spatulate fingers, she took off, hurdled my hand and I had to rescue her in mid-air on the way to the floor. Back again on the table she sheathed her eyes and began that patient waiting which for a frog makes time of no account. We found that a certain cure for restlessness was gently to stroke her back and head with a soft camel's-hair brush. This invariably induced a long period of quiescence. After two forays she accepted this routine as part of her present experience.

We now witnessed one of the most remarkable births among all the jungle creatures. The opening on the lower back of the frog widened, forming the center of a narrow open spindle, as if one should bend apart the thin slats of a venetian blind. A tangle of thickened tissue pushed out.

The frog in the gap was suddenly hustled out by succeeding impatient brethren. He struggled free, did a slide down his mother's bent thigh and somersaulted to the ground. Here he righted himself, looked around and then scraped at his eye where something had lodged. Two scrapes made all well, but no sooner did he gather his feet together and sit upright exactly as his mother had always sat, than he was knocked head over heels by a brother who rocketed into him. Both rolled over and over, then rerighted, almost touching noses and staring into each other's eyes with what emotion we can only surmise. The humor of their serious little faces made it almost reasonable to imagine one whispering to the other, "Don't look now, but I think we are being followed!"

Out of the bulging membrane, eyes and snouts began to appear, and sometimes four frogs would start a terrific struggle as to which should be born first. The supply seemed unending. There poured out a perfect stream of infants all eager to enter the world and begin their adventures. Individuality was apparent the moment they pushed free. One which was darker than the rest was a superb acrobat. He leaped clear, took off from his mother's back and made a perfect four-point landing. Almost with the same motion he turned half around and a second leap took him high over the back of his parent and all his quiescent brothers and sisters. To claim equality with this little frog a human new-born baby should be able to leap twenty feet into the air and forty feet distant. Man against animals would never win a point at the Olympic Games!

Another frog landed on his mother's back and remained there, seeming to have expired with his natal effort. I poked him gently and the trance or malingering passed like a shadow and he leaped about from end to end of the table like one possessed. Twice I saw frogs push their heads out from the soft blanket tissue and then without reason, suddenly turn and dive back into the dark interior where they had gone through egg and tadpole stages. What reluctance to face the world inspired this couple we will never fathom.

Through it all the parent showed not the least emotion. Now and then her eyes would goggle up as several of her sons and daughters landed

on snout or back. One small frog leaped full on to a protruding eye, which promptly sank from view beneath him, while the other eye remained elevated, expressionless.

We realized that once the stream was in spate, and all physical connection broken, the relationship was less that of parent and offspring, than of one and twenty individual frogs differing only in size. From the moment they emerged, in color, pattern, stance, movement, they were reduced replicas of their own parents.

Their gradual adaptation to wild life is another story, but one of my first observations in this respect was of a froglet eight hours old, waging and losing a prolonged battle with a very small moth whose wings upset and battered the optimistic amphibian while he futilely endeavored to swallow the body.

The parent of this brood moped for a few days, gaunt and shrunken in her bivouac under a log, but soon her appetite returned, she gained weight and the nursery exit in her back closed and completely disappeared. An unending diet of moths restored her to perfect health by the time we were ready to ship her in a moss-lined jar over land and sea to an exhibition case in our Zoological Park.

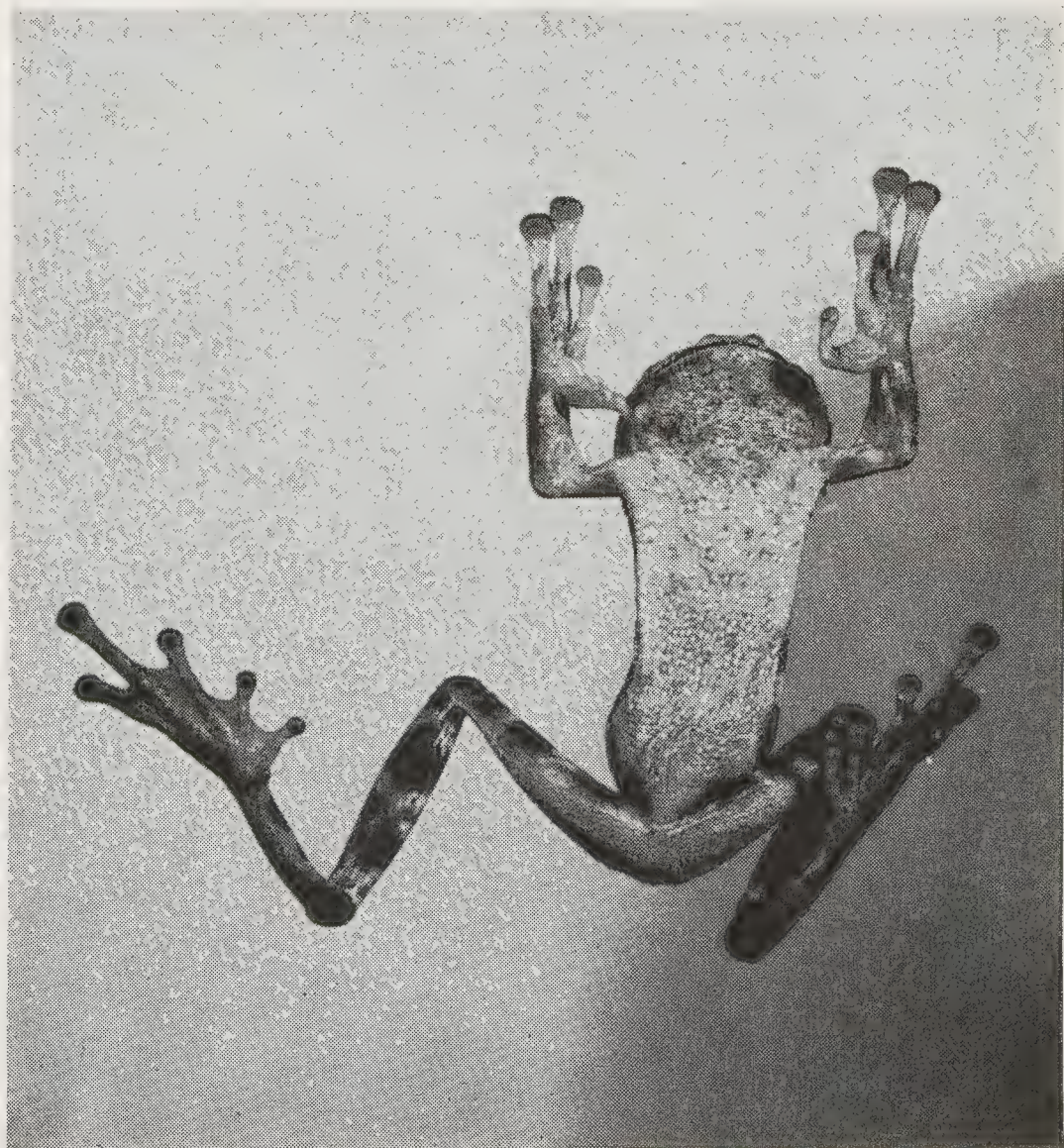
No one will dispute the propriety of priority

in the nomenclature of animals but sometimes changes based on temporal reasons are made at the expense of etymological sense. In 1858 Dr. Günther gave the generic term *Nototrema* to this group of frogs, which is apt enough if we translate it freely as a creature with a hole-in-its-back. The name *Gastrotheca* must, however, be given precedence as having been applied by Dr. Fitzinger fifteen years earlier. But this implies, quite erroneously, that the eggs are carried beneath and not on top of the body. No criticism can be found, however, with the specific name *ovifera*.

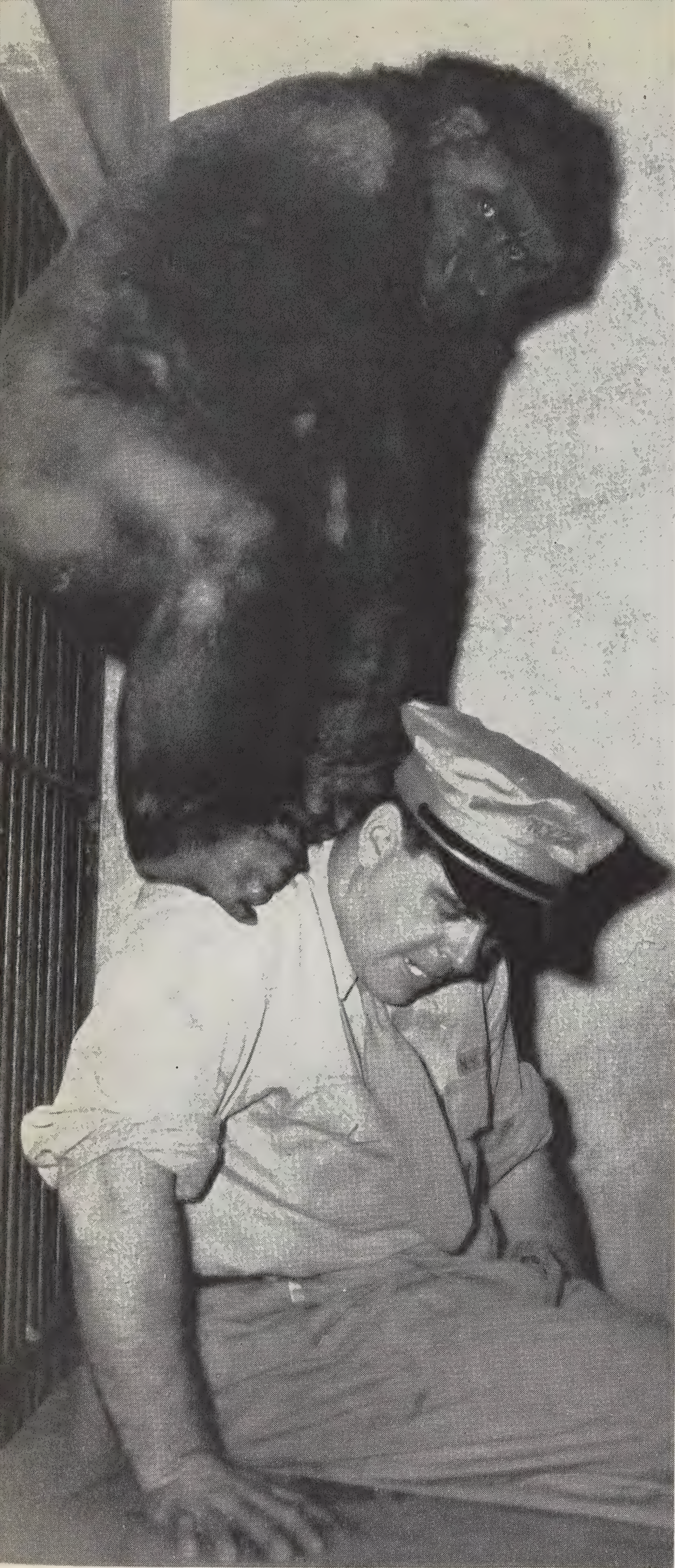
As I have said, we missed the first part of the breeding season and have no idea how the eggs first get into the pouch and become so regularly distributed two rows deep. Perhaps the male frog gathers them up as they are laid, or more probably it is the mother who is able to manipulate them into their living nursery. Anyone who has seen a great sea turtle prepare her nest in the sand of a tropical beach, deposit her eggs in exactly the right place, cover them and conceal the spot, all by the deft use of her mittened hind flippers and altogether sight unseen, will not, for a moment, doubt the possibility of the analogous use of the more supple limbs of the gray frog of Rancho Grande.



PATTERN on the back of the frog may be seen as it clings to a glass. It is thin and emaciated after the hatching of its many babies.



FROM BENEATH the Marsupial Frog is not as distinguished as it appears from above. The suction-pads on its toes are clearly visible here.



WARMING UP PERIOD FOR THE WEIGHING CONTEST ALWAYS STARTS WITH OKA CLIMBING ON KEEPER REILLEY'S BACK, FOR WHEN SHE WAS MUCH SMALLER HE USED TO WEIGH HIMSELF AND HER AT THE SAME TIME.

How to Weigh a GORILLA

By WILLIAM BRIDGES

PROBABLY there are many ways to weigh a Gorilla. Every Zoological Garden fortunate enough to possess the greatest of the great apes no doubt has its own unique and sure-fire method.

The Bronx Zoo has Keeper Jim Reilley of the Primate House — and Reilley has the Reilley System for weighing Oka, our female Gorilla, on the twentieth of every month.

The pictures on this and the next three pages are, in essence, the Reilley System. They don't look like much of a system to you? They look as if Reilley were having to fight for his life?

That's the Reilley System!

Actually, weighing Oka is just as much fun as it looks, and not nearly as dangerous. Oka (we have Keeper Reilley's word for it) loves to be weighed and she wouldn't *think* of really biting him into little pieces. When her teeth close down on his ear, his hand, his shoulder, she knows exactly when to stop. Up to now, her idea of when to stop, and Reilley's, have pretty nearly always coincided.

When Oka came to us in September, 1941, she weighed 20 pounds. Her last weighing revealed 174 pounds and she has been putting on two to four pounds a month in the past year. Keeper Reilley, on the other hand, loses about two pounds every time he wrestles Oka onto the scales.

As for Makoko, the male Gorilla — well, even the Reilley (or Catch-as-Catch-Can) System is no good for weighing *him*. He, too, likes the fun of being weighed, likes to wrestle and pretend to bite. But unlike Oka, he doesn't know when to stop. So we guess he weighs about 240 pounds. As far as Reilley is concerned, it will go on being a guess.



AFTER CROUCHING ON THE SCALES TO MAKE WEIGHING LOOK ATTRACTIVE, REILLEY TRYs MORE STRENUOUS METHOd



NEXT THE KEEPER TRIES BRIBERY WITH A BANANA.



OKA LIKES THAT VERY MUCH — LIKES REILLEY, TOO



JUST ABOUT THEN THE GOING GETS A LITTLE ROUGH.



NO VICTORY YET, BUT REILLEY'S GETTING CLOSER.



MAKOKO WATCHES FROM HIS NEUTRAL CORNER.



THEN OKA GETS INTERESTED IN THE NEW PLAYTHING



D AFTER ALL THAT EXCITEMENT, OKA SITS DOWN ON THE SCALES AS QUIETLY AS YOU PLEASE! SHE INSISTED ON
CKING HER FINGER IN THE READING SLOT, AND HER KEEPER COULDN'T SEE WHAT SHE WEIGHED, BUT OTHERWISE -



CHAUTAUQUA MUSKELLUNGE—A 40-POUND, 50-INCH, HEADLONG AND TACKLE-SMASHING FISH.

Fish Do Come Back

By BEN EAST

TWENTY YEARS ago it was a good trout stream. You fished it regularly as a boy and you could count on a full creel any time the weather man wasn't dead against you. Now it's so badly fished out it isn't worth your time to drive the thirty miles from town, even on cloudy May afternoons when the gray drakes are hatching. The trout simply aren't there any more.

Then there's the lake you knew in the old days. It was always good for a string of yellow perch and bluegills. You counted it a rare occasion if an hour of casting didn't turn up two or three fair bass, and pike could be had for the taking almost any time you felt like towing a trolling spoon along the reed beds. But the lake is fished out too. It's no better than the creek today. You wrote 'em both off as a total loss years ago. If you want good fishing now you have to go a long way from home to get it. You take two weeks off each summer and traipse up into the wilderness and get the kind of fishing you dream about.

Well, there's nothing wrong with that. Those trips to distant waters are good fun. But how

about the times in between? How about the week-ends when there's no chance to reach a lake or stream 500 miles away? How about the evenings after work when you'd like to run out for an hour or two of fishing? You'd be perfectly satisfied if you came home with four or five trout or a couple of decent bass. It would be pretty swell if you had some near-at-home fishing spots for times like that, wouldn't it? It would be great, for example, if the fish in that lake or creek you knew as a kid were to stage a comeback.

Yes, it would be nice, but there's no use dreaming. Those waters are finished. They can't be brought back and that's all there is to it.

Are you sure? Have you ever looked into this question of bringing back good fishing in depleted lakes and streams? Have you asked your state conservation department to make a survey of the possibilities? Has your sportsmen's club tried any remedies?

Fishing stages a pretty spectacular comeback now and then, provided the production and harvest of the crop are managed intelligently. If you don't think so listen to the story of the

Chautauqua muskellunge of New York State. You may not be a 'lunge fisherman but the comeback of the barred musky will give you something to think about, anyway.

A hundred years ago the lakes in the upper reaches of the Allegheny river system, in the extreme western end of New York fifty-odd miles south of Niagara Falls, were famous for a magnificent game fish, the Chautauqua muskellunge. He differed sharply from the common musky of Wisconsin, Michigan, Canada and other sections of the North American continent. He was the same savage killer, forever prowling, always hungry. He had the long, wicked torpedo shape, the ugly snout, the steelshod jaws. He was a head-long, reckless tackle smasher, as big as any musky that swam, reaching commonly to a length of fifty inches and a weight in excess of forty pounds.

But there the resemblance ended. The Chau-

tauqua muskellunge was a fish by himself, an offshoot of the clan, a separate and distinct species entitled to a place in the sun on the strength of his performance.

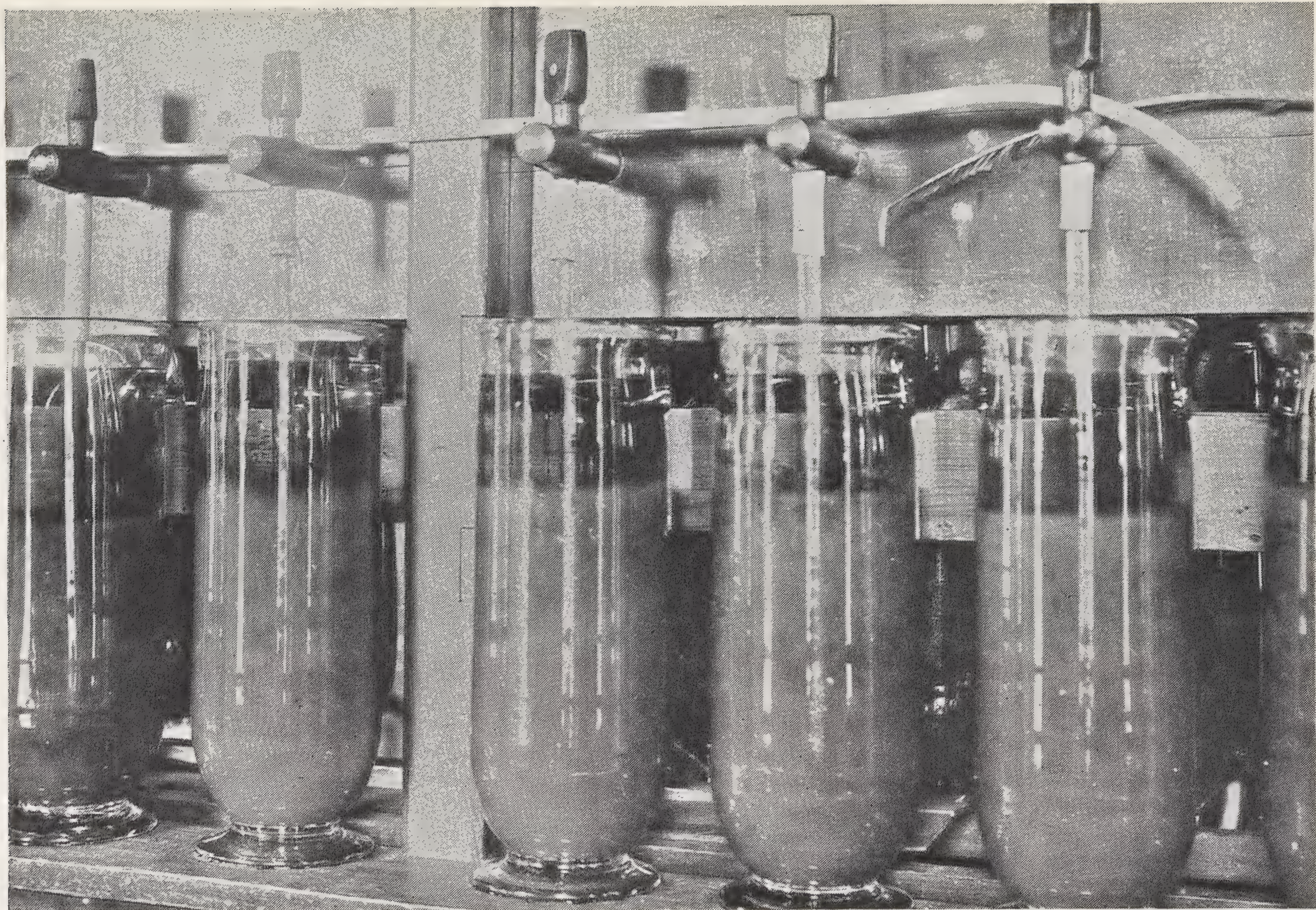
He took his common name from Lake Chautauqua, where he reached his greatest abundance. He might just as readily have been called the barred muskellunge. He was the Beau Brummel of his family, maybe the handsomest member of the whole pike tribe. His ground color was not the silver gray of the common 'lunge. Above he was dark olive-green, shading into a brassy or metallic green on the sides and paler brass on the belly. The top of his head was black-green, his lower jaw and throat white. And streaking his lustrous sides was a color pattern of darker green laid on in narrow vertical bars.

He was by a wide margin the most important fish in Lake Chautauqua, so plentiful in the early days that he was taken for sale as well as for



N. Y. State Conservation Dept. Photo

QUICKLY AND EXPERTLY THE STATE FISHERIES MEN STRIP EGGS FROM A 40-POUND MUSKELLUNGE FOR BEMUS POINT HATCHERY. IN A MOMENT THE FISH WILL BE RETURNED TO THE WATER.



N. Y. State Conservation Dept. Photo

THOUSANDS UPON THOUSANDS OF CHAUTAUQUA MUSKELLUNGE ARE BEING PROPAGATED IN THESE JARS IN BEMUS POINT HATCHERY. IT HAS BEEN IN OPERATION MORE THAN 40 YEARS.

sport. His range was limited but it did include the Mahoning river and the upper waters of the Ohio, and wherever he was found he was considered as good a food fish as the salmon and a great scrapper living up to every tradition of the musky clan.

For a long time all went well with him. Around 1890 New York began the hatching and planting of muskellunge fry, just by way of giving him a boost, and in eight years, from 1890 to 1898, more than 18,000,000 baby muskies were produced, the bulk of them planted back in Chautauqua, the lake of their forbears. In 1904 the Bemus Point hatchery was built exclusively for muskellunge propagation and everybody felt pretty good about it. Fishing for the famous barred 'lunge would be good for all time to come, it appeared.

But the best-laid plans of fish culturists don't always work out. In this case it didn't take long for the handwriting to appear on the wall.

From 1910 to 1920 about 2,000 muskellunge showed up each spring in the nets set by New

York fish men to take spawners for stripping purposes to supply eggs for Bemus Point. The next ten years the annual catch showed a tendency to slump, dropping to an average of about 1,600 fish a year. Then, early in the 1930's, the Chautauqua 'lunge really hit the skids. And when the 1940 spawning season rolled around the best the nets could do was 582 fish, about a quarter as many as had been taken yearly when the hatchery opened. At the same time, of course, the bottom fell out of musky fishing in the lake and sportsmen started to pour an avalanche of protests and complaints in on the New York State Conservation Department.

The department's fish men had a choice of two courses. They could sit back and fold their arms and say to the sportsmen, "The lake is fished out. The muskies are gone. Things will never be the same again."

Or they could move in and try to do something. They could attempt to learn what had happened to the great barred muskellunge and



N. Y. State Conservation Dept. Photo

AFTER HATCHING, THE FINGERLINGS LIVE FOR A TIME IN THE HATCHERY POND. WHEN THEY HAVE ATTAINED SUFFICIENT SIZE THEY ARE SEINED UP AND LIBERATED IN LAKE CHAUTAUQUA.

figure out ways to correct the mistakes of the past.

They moved in. The outlook wasn't rosy. Fishing had gone to pot. A lot of sportsmen believed the Chautauqua 'lunge was following the road that had been taken earlier by the passenger pigeon, the heath hen, the Michigan grayling and a few other forms of American wildlife — the road of no return. The fish men themselves were inclined to agree.

The first thing they needed to know was what had caused the decline. Overfishing? Inadequate laws? Too many good roads and fishermen, too many outboards and cabin cruisers? Before the patient could be cured, the fish men agreed, they'd have to diagnose the ailment.

It didn't take long for them to come to some definite conclusions. Overfishing certainly had played a part. With the use of power boats on Lake Chautauqua had come deep-trolling with copper lines, as lake trout are commonly taken in some parts of the country. The deep-trolling produced good catches in the deep holes in July

and August. Before the copper line came into use those deep holes had served virtually as fish refuges through the late summer. Muskies were being taken now at a season and in waters where heretofore they had gone as good as unmolested.

At the same time the use of live bait in late autumn took a big jump in popularity. Lake Chautauqua fishermen learned that this method took real lunkers. What they didn't stop to realize was that those same lunkers were the backbone of the lake's spawnings stock. Catching them and taking muskies on copper lines in deep water was like drawing on a savings account. The more you take out, the less interest you get.

But overfishing wasn't the whole story. Other things had happened to the muskellunge population, the fish men discovered. Many years before some well-meaning but misguided souls had introduced two new fish into Lake Chautauqua in the hope of improving fishing by giving anglers additional variety. Carp and calico bass had been stocked.

The carp certainly hadn't done any good. As for the calico, he's a good little panfish in his own right but he hadn't helped musky fishing a bit. He's a minnow feeder, and so is the muskellunge. As such they compete with each other for food, exactly in the same fashion a flock of sheep and a herd of cows compete for grass in a common pasture. It takes a bit of imagination to picture a six-inch calico competing with a fifty-inch 'lunge in the chow line, but if you'll think about it for a minute it becomes crystal clear.

An acre of water, whether lake or stream, will produce a certain poundage of fish annually under given conditions, as any fish technician can tell you. Say, for the sake of convenience, it's twenty pounds of game fish per acre. You can have that twenty pounds in calico bass or in muskellunge, or half and half — but you can't have twenty pounds of each! So the calicoes and the muskies weren't doing each other any good and the fish men decided without hesitation that the speckled bass had no business in one of the country's leading muskellunge lakes. They still don't know how to get 'em out, however.

There was another important reason for the musky decline. The male fish, it was found, is mature and ready to spawn when he is about twenty-four inches long. But the female must wait until she attains a length of close to thirty-two inches. And the muskellunge size limit on Lake Chautauqua had long been twenty-four inches — which meant that the bulk of the female 'lunge were being caught before they had had a chance to make their first contribution to future generations of their kind.

The fish men added up their findings and came forward with a plan. They proposed a program of intensive fish management in the hope of bringing back the great barred tigers.

First, they said, the catch must be cut down. To offset the heavy fishing they suggested a limit of one fish a day and five a year. And to make sure that nobody cheated they issued a special musky license at a cost of 25 cents. The New York State Conservation Department wasn't interested in making money on the deal. What was wanted was rigid control. The special license provided it. With the license went five metal seals, much like those used by deer hunters in various states. When a fisherman caught a

muskellunge he slipped one of the seals in the mouth, out through the gills and locked it in place as a freight car seal is locked. It was illegal to possess an unsealed musky and when the legal limit for the season was taken and the five seals used up, the fisherman was through.

At the same time the late fall fishing that had accounted for a lot of big muskellunge was eliminated by shortening the season fifteen days, ending it in mid-October. The copper line was outlawed and the fisherman was limited to a lure carrying not more than six hooks. Most important of all, the size limit was stepped up to thirty-two inches. That change put a halt to the taking of female fish before their first spawning and put millions of fry into Lake Chautauqua each spring. A mature musky produces an average of 50,000 eggs at a spawning. You don't have to save many such breeders to balloon your hatch into big figures.

"The thirty-two inch limit was the iron lung that kept the Chautauqua musky going through its most critical period," says Cecil Heacox, fish biologist of the New York State Conservation Department.

And while all this was happening, while the musky harvest was being cut down and fishermen were being restrained for the sake of future gains, New York wasn't overlooking any bets at the production end. The men in charge of the Bemus Point hatchery were discovering some new and untried wrinkles in muskellunge rearing. They came up with a system for growing fingerlings on a production basis. And that is no easy trick.

Young trout can be reared to fingerling size on a diet of ground sheep liver. Black bass thrive nicely in ponds that are well salted with daphnia, better known as water fleas. Not so young muskies. They want natural food and their natural food is fish smaller than themselves. Denied a plentiful supply of forage minnows, they do about what you'd expect of members of the pike and musky family. They eat each other. Even when victuals on the fin are plentiful in the rearing ponds, there is still some cannibalism among growing muskellunge. But the more minnows the less cannibalism, the New York hatchery men discovered. So they started scrambling for a steady supply of golden shiners. It kept a gang

busy most of the time the first year, but the results were encouraging. The baby muskies thrived and grew and when the first rearing season came to an end, back in 1941, there were 17,000 fingerling Chautauquas ready to go back to stock the waters their clan had made famous.

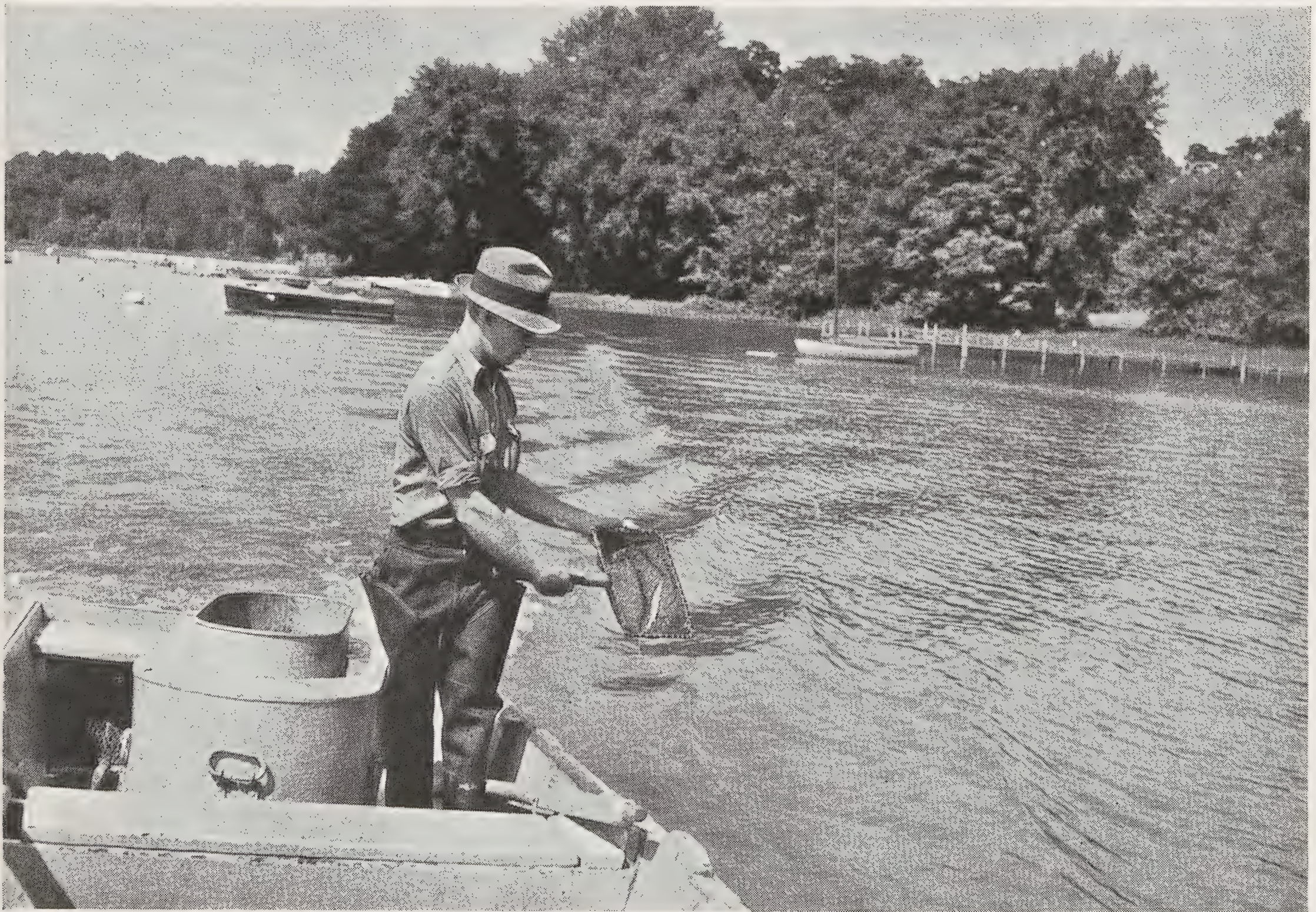
A fingerling musky, incidentally, is quite a fish, ranging from eight to twelve inches in length. There are stages in the growth of these lusty youngsters when the golden shiners can outswim them. Of course, if there are enough shiners in the pond, the little muskellunge overtakes one sooner or later, but the New York fish men are still looking around for a forage minnow with less speed and slower getaway.

Nor did they stop with increased production and restricted harvest. A research program also was set up in 1941, designed to gather all the information possible about the Chautauqua 'lunge, how fast he grew, when and where he spawned, how long he lived and other facts about his life history that might be useful in building up better fishing as time went on.

Out of that research program came one of the most interesting pieces of wildlife publicity that has made the front pages in recent years — the story of Minnie Methuselah.

Back in the period before the Chautauqua muskellunge hit the skids. New York started tagging the muskies it netted for stripping purposes, as a means of acquiring information. Among the fish tagged in the spring of 1930 was a young female, probably four or five years old and ready for her first or second spawning. There was nothing about her at the time to distinguish her from the others in the net. Stripped of her roe, she was given New York State Conservation Department tag No. 230 and returned to the lake to go her way.

For fifteen years no more was heard of her. All that time, as things turned out, she avoided trolling spoons and live bait, copper lines and casting gear and all the other fish tackle dragged through the waters of Lake Chautauqua. She even managed to shun the nets set by the hatchery crews each spring at spawning time — until



N. Y. State Conservation Dept. Photo

LAST ACT IN THE PROGRAM THAT HAS RESTORED THE CHAUTAUQUA MUSKELLUNGE IS THE RE-STOCKING OF THE LAKE WITH FINGERLINGS HATCHED AND REARED IN BEMUS POINT HATCHERY.

1945. Among the 1,951 muskies dredged up that season was Minnie, a stout-bodied dowager of a fish. The men who netted her rubbed their eyes in disbelief but there was no questioning the evidence. Bedded deep in her dorsal fin she still carried tag No. 230. She was the same 'lunge that had turned up for stripping fifteen years before.

They named her Minnie Methuselah on the spot. They measured her, stripped her and returned her tenderly to the lake. Among New York's postwar wildlife plans is a new \$80,000 muskellunge hatchery. State fish men fervently hope Minnie survives to christen the new plant with her spawn. She's a big musky now, just a hair under fifty inches long, but she wears her twenty years lightly and unless she gets careless in her old age there is no reason why she shouldn't fulfill the wish.

The fish men calculate she has laid not fewer than three-quarters of a million eggs in her lifetime. If one out of a hundred of her offspring has lived to attain legal size, Minnie has provided close to 7,500 muskies for the fishermen of Lake Chautauqua. So far as the New York experts know, she holds the world's title for age among fresh-water game fish and she has toted a tag longer than any other fish on record. She got publicity from coast to coast and she's the darling of the whole New York State Conservation Department.

To get back to the story of the barred muskellunge and his comeback, the spawning nets in Lake Chautauqua in 1941 captured fewer than 600 fish. That July the new program went into effect, including the shorter season, reduced take and 32-inch size limit. Results were prompt and encouraging. The following spring the nets took 955 muskies. A year later, in 1943, the take was 1,418. And in 1945 it lacked only 49 fish of hitting the 2,000 level that had been considered

a satisfactory catch of spawners back in the boom days before 1930. The Chautauqua 'lunge were really coming back. The spawning nets, operated for about twenty days each spring, were telling the story.

At the same time, muskellunge fishermen who frequented Chautauqua were cashing in. In 1941, with 5,000 special licenses issued, the total take was only 817 fish. Fewer than twelve anglers out of a hundred took muskellunge that season.

A year later luck was better. Again 5,000 anglers bought licenses. They reported a take of 1,512 muskies. Twenty out of a hundred scored that year. And in 1943, 4,400 fishermen took 1,938 muskellunge. A year later the catch climbed up to 3,488 and it's still mounting. Fish management in Lake Chautauqua is paying bigger dividends than anyone dared hope for five or six years ago.

It still takes, on the average, more than sixty hours to catch a barred musky. But that's a whole lot better than the 168 hours that were required back in 1941. And the men who are running the show believe the time between strikes will grow shorter and shorter as the years go by, unless the lake is invaded by an army of fishermen far too big for its capacity to produce muskellunge. It seems that the great and glamorous and historic fish has been saved from extinction.

Suppose your favorite water is fished out. The bass and trout you used to take don't live there any more. Well, don't be downhearted. There may be ways, practical, workable ways, to restore that lake or stream of yours to the levels of twenty years ago. Don't give up hope for the close-to-home fishing spot you have dreamed about. Sound fish management, backed by you and other sportsmen, may not be able to work miracles but it can bring surprising results. Fish do come back.

42½ Years of Gardening In the Zoological Park

By **GEORGE SKENE**

EDITOR'S NOTE: For more than four decades George Skene was successively Gardener, Head Gardener and General Foreman of Maintenance in the Zoological Park. He retired on July 1, 1946. No one else knows so much about the physical changes that have taken place in the Park. He directed the whole forestry and landscaping program over many years and helped to create one of the most beautiful Zoological Parks in the world. For that reason, we have asked him to prepare a historical memoir that is unusually appropriate in this fiftieth year of the Zoological Society's existence.

WHEN I FIRST became connected with the New York Zoological Park, on January 1, 1904, it was for the most part literally a wilderness. Today there are perhaps millions of people in New York City who have never seen, and never will see, such a wilderness of giant trees, brambles, bogs, weeds and bushes as existed in what is now the familiar, orderly, well-kept Bronx Zoo.

New York City had acquired the whole Bronx Park area in the 'eighties, but had done nothing toward its development. The new Zoo had to be carved out of virtually virgin forest, although in some sections there were the remains of stone walls that had separated the pastures, orchards and meadows of what had been the Lydig estate. A few ancient, twisted pear trees are still standing, still bearing sweet pears, in the Zoological Park today. The neighborhood boys know them well!

The Zoological Society took control of 261 acres in the southern portion of Bronx Park on August 1, 1898, and one of its first acts was to appoint Hermann W. Merkel as Chief Forester. No better man could have been found. In those early days I was a gardener in our sister institution, the New York Botanical Garden. I liked the way Mr. Merkel was setting about his tremendous task of building a Zoo in a wilderness, and near the end of 1903 I asked him for a job.

A few weeks later I reported for work, on New Year's Day, 1904.

When I joined the gardening staff, Mr. Merkel had been busy for five years and the tangle of overgrown vegetation was being cleared out, although the naturalness of the area was being preserved as much as possible — the direct result of a policy laid down by H. A. Caparn, the landscape architect, and Herbert Parsons, the consulting engineer. I am glad to be able to say that policy still holds good today.

We knew, of course, that there would be tremendous changes as the Zoological Park's own buildings and exhibition areas grew, and that the neighborhood around the Park would change. There were few signs even of beginning change forty-three years ago; those were still the horse-and-buggy days and the only other means of reaching the Zoo was via the New York Central railroad to the Fordham or Botanical Garden stations, or by the "Huckleberry Railroad" — the street car system so-called because the leisurely conductors often stopped around lunchtime to gather a mess of huckleberries along the tracks. Immediately outside the boundaries of the Zoological Park the village of Bronxdale still flourished, with its little red schoolhouse, its Methodist church, its country store, tavern and smithy.

I do recall one forecast of the future — an omen that was more significant than we realized at the



OPENING OF THE NEW SUBWAY SERVICE FROM DOWNTOWN BROUGHT A TIDE OF VISITORS TO THE BOSTON ROAD GATE. HUNDREDS OF DECORATIVE TREES AND SHRUBS WERE PLANTED BY 1908.

time. I recall one of the Vanderbilts chugging past the Zoo in his White steamer, the driver and his friends heavily goggled and swathed in dust-ers, on their way to the Morris Park Racetrack by way of Pelham Parkway and Bear Swamp Road.

Much of the massive planting that today is so natural a part of the Zoo's landscaping that it seems always to have been there, actually was planted about 1905. The south and west borders of the Zoo were heavily planted about that time, as a screen from the encroaching apartment houses and as a windbreak, and literally thousands of trees and shrubs were put in, especially in Beaver Valley. Today that area has a pleasing, natural wildness.

European linden trees were planted originally around Baird Court but in 1907 they were replaced by American elms, not only because they were native trees but because of their faster, taller and more arching growth. The elms calipered 3 1/2 to 4 inches when they were planted; in the almost forty years since then, they have grown to a thickness of nearly two feet.

A tragedy of early years was the loss of several hundred chestnut trees following the appear-

ance of the fungoid growth known as cytospora, in 1905. Now this useful native tree has been exterminated in the eastern United States.

Today our visitors would be astonished if they found the face of the Park changed beyond recognition from one summer to the next. It is true that the Zoological Society has created many new exhibits in recent years, and greater ones are planned for the near future. But in the time of which I write, thirty or more years ago, the Park was surging forward in its first development and radical changes occurred from one season to the next. The opening of the new subway to 180th Street and Boston Road caused a turn in the tide of visitors to the south end of the Park, and in 1907 trees and shrubs were set out there by the hundreds. At the same time we were rushing the decorative planting to prepare for the opening of the Concourse Gate at Pelham Parkway, and lining the road from the gate to the Administration Building with the American elms that now arch so gracefully over the road and walks. In 1910 the Administration Building was opened and the Italian Fountain, originally set on the plaza almost on the site of what was to become

the Heads and Horns Museum, was moved down to its present more appropriate location.

Every year some new area was finished and developed; the Eagles and Vultures Aviary in 1912, the Marsh Garden and the pools along the shady brook of Bird Valley the next year.

But most of the original plans were completed by 1914, and the "spade work" of creating a beautiful setting for a great zoological collection was done.

Hermann Merkel resigned in 1925 to become general superintendent of maintenance for the Westchester County Parkway Commission. I became Head Gardener the following year. The last twenty years have not been uneventful, and in a more extended series of notes I have prepared for the archives of the Zoological Society, I have had occasion to refer to our fights against the hickory bark borer, the tent caterpillar, the bagworm, the Dutch elm disease, the Japanese beetle, gypsy moths; the havoc wrought by the

hurricane of September, 1938, and the ice storm of March, 1940. Our tree population, estimated at 250,000 has had its ups and downs.

In 1940 the forestry gardening and some other departments were merged in a Maintenance Department and I became General Foreman of Maintenance. And now, as the day of my retirement has passed and I look back over my forty-two and a half years in the service of the Zoological Society, I am proud to have been associated with the officers and men who planned and brought the Park to its present level of beauty and usefulness. The Zoological Society is an institution conducive to knowledge, to entertainment and to recreation, a leader in conservation, and a power in creating a finer appreciation of the wonders of nature. I trust that the inspiring plans that our officers have made for the further development of the Park will be brought to a successful conclusion in the not too distant future.



TRUSTEES OF FRIENDSHIP

(Continued from Page 192)

opportunity on behalf of our institution of congratulating your government on an outstanding achievement in the establishment and the operations of your national parks in the Belgian Congo. The Albert, the Garamba, the Kagera and the Upemba are superbly, wonderfully operated. They are sanctuaries, protected, we trust, for all time, and we extend to you our profound congratulations on your great accomplishment in the conservation of wild life and the preservation of beautiful things on this earth."

Mr. Osborn then read a note from Park Commissioner Moses:

"On behalf of the City I congratulate the Zoo on its enterprise, Mr. Spaak and the Belgian government on their generosity, and our children on a gift which, to paraphrase Dr. Samuel Johnson, will add immeasurably to the gaiety of nations and to the world's all too limited stock of harmless pleasure.

"No matter how great and beneficial will be the achievements of Mr. Spaak as President of the General Assembly of the United Nations, and no matter how much publicity and acclaim he may receive in this capacity, nothing he can do in this country will result in greater applause and public approval than the gift of these three small elephants to the New York Zoological Society.

"I hope the United Nations will stay here permanently at Flushing Meadows, if only to see the three elephants thrive and grow in the care of Fairfield Osborn and his associates."

Only the Beginning

This party welcoming our Belgian friends and formally introducing our fine young African elephants to the Society's membership is but the first Oasis of our Expedition into the future. Many more equally interesting and exciting events are planned for the months ahead.

In January comes the Society's 51st Annual Meeting at the Hotel Waldorf-Astoria where living exhibits, fascinating new films and brief reports of the Society's progress add up to one of

the most entertaining evenings of the whole winter season. February will see a members' preview of the Père David's deer — the rarest of all deer and the first ever to visit the western hemisphere. So on through March, April and May — the opening of the truly beautiful new Small Mammal House, a reception for a remarkable collection of tropical birds, and — perhaps most interesting of all — a members' welcome party for the Duck-billed Platypus, coming to us from Australia for the first time since 1922. This strangest of all mammals requires a unique handling technique that will be fully as entertaining to inspect as the sight of the animals themselves.

In June, of course, comes the Garden Party at the Park — an event in which hundreds of members from everywhere annually participate.

Your Society plans from now on to give you a fascinating schedule of special events — occasions when you and your friends can enjoy the rare treasures of the collections under the most favorable conditions.

Why Not Give an Unusually Valuable Christmas Present?

If you make gifts of Society memberships at this time, your friends can enjoy the full schedule of these events of the year 1947. They can benefit from the full and accurate reports of them that will appear as they occur, in *ANIMAL KINGDOM*.

A gift of a Society membership is an unusually thoughtful present for anyone interested in any phase of the world of nature. It lasts all year, and it gives constantly recurring pleasure. Anyone interested in any part of the Society's work is eligible for membership. There are no scientific or educational requirements to be fulfilled. There are no age restrictions. We have members from under 9 to over 90. We welcome younger people with enthusiasm, for many of our most loyal members through the years joined our ranks when they were children.

Just send names and addresses with your remittance for dues to the Membership Office, New York Zoological Society, 630 Fifth Avenue, New York 20. An attractive card notifying the recipients of their election will be sent by us in time for their Christmas stockings.

New Members of the New York Zoological Society

New members of the Society since the last issue of ANIMAL KINGDOM was published are the following:

Life Members

Jack F. Chrysler
Mrs. F. Ambrose Clark
Henry M. Crane
Richard Bayard Dominick
Mrs. Childs Frick
Mrs. John L. Given

Edward H. Green
Joseph Jennen
Miss Iris Jennings
Gilbert W. Kahn
F. Hallett Lovell
William McChesney Martin, Jr.

Mrs. David H. McAlpin
Mrs. S. H. Ordway
Mrs. Irving H. Pardee
Mrs. Nelson B. Sackett
Joseph H. Seaman, Jr.
William A. Slater

Annual Members

Luis Abella, Jr.
Johnfritz Achelis
Richard H. Adelson
Philip R. Allen
Mrs. Philip R. Allen
Charles L. Amos
L. C. Amos
Dr. Arthur F. Anderson
George A. Anderson
Mortimer R. Anstice
W. C. Arkell
Allison Armour
James F. Armstrong
James M. Austin
Harold L. Bache
Norbert H. Bachmann
Professor K. N. Bahl
Herman F. Ball
Miss Amy Hope Ballard
Mrs. Katheryn Barbarotti
Vincent G. Barnett
J. Ainslee Bear
Miss Jane Behringer
Lawrence Bennett
Miss Mildred Bent
Richard J. Bernhard
Charles A. Berns
Theodore Bernstein
Clement M. Biddle
Dr. William Bierman
Edward H. Bilke
Mrs. F. M. Blagden
Marston T. Bogert
Mrs. Sidney C. Borg
Caxton Brown
James Oliver Brown
George L. Bubb
Mrs. Richard De Wolfe Brixey
Joseph R. Busk
Kirk L. Cameron
Frederic E. Camp
Mrs. R. W. Carle
Harvey D. Carter
Mrs. Percy M. Chandler

Mrs. William L. Chenery
Arthur O. Choate, Jr.
Mrs. Leighton H. Coleman
Mrs. John Colgate
Mrs. Francis S. Colt
F. S. Connett
Arthur E. Connick
Mrs. Arthur Coppell
Mrs. John Corbin
Miss Ursula Corning
Mrs. Granger Costikyan
Reuben B. Crispell
Robert L. Crowell
Mrs. Chandler Cudlipp
Robert C. Cumming
Dr. Walter Damrosch
Edward Nathan Dane
Roger Dane
Frederick M. Davies
Mrs. George W. Davison
Eli Whitney Debevoise
Miss Marguerite Decroix
Henry L. de Forest
Frederic A. Delano
Mrs. Lyman Delano
Charles B. H. Deller
Edwin H. Denby
George M. Dexter
Adolph M. Dick
W. Palmer Dixon
Mrs. C. E. Dodge
George Doubleday
Barclay K. Douglas
L. W. Douglas
Charles D. Draper
Alexander W. Dreyfoos
Mrs. Carolyn P. Duane
Mrs. J. Clinton Edgar
Dean S. Edmonds
Mrs. Roswell Eldridge
William L. Elkins
Mrs. B. Tappen Fairchild
W. L. Faust
Charles J. Fay

George Fitch
Laurence B. Fletcher
Harold Fowler
Mrs. Byron C. Foy
Arthur B. Foye
William Fraser
Miss Gladys U. Freeman
Salvatore J. Friscia, Jr.
Frederick G. Frost, Jr.
C. Herbert Gale
Mrs. Sidney Gamble
Thomas S. Gates
Jacob H. Geise
Mrs. Aquila Giles
Henry S. Glazier, Jr.
Mrs. Milton M. Goldsmith
Allan E. Goodhue
A. C. Goodyear
Louis W. Gordon
Dr. Charles Gottlieb
Mrs. Wheadon M. Grant
Archibald R. Graustein
Reginald Gray
Mrs. Thomas H. Gray, Jr.
Frederick William Greenfield
Mrs. Edward W. Grew
Miss Susanne Grigsby
Mrs. P. I. Gulden
Mrs. William A. Hamann
J. R. Harrison
Wallace K. Harrison
Stewart S. Hathaway
Dr. Alan Hazeltine
Frederick M. Heimerdinger
Alexander I. Henderson
Mr. and Mrs. Andrew H. Hepburn
Dr. Charles Gordon Heyd
John W. Higgins
Robert M. Hillas
Harry R. Hillman
Mrs. James M. Hills
Daniel B. Hinckley
Edward J. Holmes
Claude Hooke

Edward R. Houghton
 Mrs. G. H. Humphreys
 Mrs. Malcolm DuBois Hunter
 Miss Elizabeth Quincy Huntington
 Philip Isles
 Henry Ittleson, Jr.
 Dr. Joseph R. Jehl
 Mrs. Farish A. Jenkins
 Percy Hall Jennings
 Sylvester Johnson
 John Jonas
 Mrs. Charles Jones
 Gilbert Sherburne Kahn
 Harry Kanter
 Thomas Smith Kelly
 Miss Isabelle Kemp
 Miss Marion Kemp
 Mrs. A. B. Kienzel
 Mrs. Garrett B. Kip
 Mrs. Charles A. Kirk
 Mrs. William R. Kirkland, Jr.
 R. C. Klugescheid
 Henry F. J. Knobloch
 Eben B. Knowlton
 Walter Kocher
 Lothair S. Kohnstamm
 Mrs. Shepard Krech
 Edwin G. Lauder, Jr.
 Mrs. James F. Lawrence
 Richard W. Lawrence, Jr.
 Miss Fanny Heaslip Lea
 Loyal Leale
 James T. Lee
 S. D. Leidesdorf
 Robert W. Lennox
 Edward A. Le Roy, Jr.
 Mrs. Robert Le Roy
 Mrs. B. J. Levy
 Madison H. Lewis
 Miss Angelica Livingston
 Gerald M. Loeb
 Mrs. Albert P. Loening
 A. L. Loomis
 F. A. Lopez Dominguez
 Mrs. William B. Lusk, Jr.
 Miss Claudia Lyon
 Mrs. Edward Mack
 H. R. Mallinson
 Edward F. Maneely
 James H. Manning
 Carl Marks
 Edgar J. Marston
 Maryland Zoological Exchange
 Mrs. John A. Mayer
 Mr. and Mrs. Edwin A. McAlpin, 3rd
 Robert M. McClung
 James D. McClure
 Allan J. McIntosh
 William Larimer Mellon, III
 Miss Ruth Melville
 Charles E. Merrill
 F. Hamilton Merrill, Jr.
 Oliver B. Merrill, Jr.
 Lawrence McK. Miller

Richard D. Miller
 David M. Milton
 Mrs. Clark H. Minor
 Mrs. Casimir de R. Moore
 Mrs. F. L. Moore
 Alexander P. Morgan
 Edwin H. Mosler
 Francis S. Moulton
 Carl L. Muller
 Romeo E. Muller
 John R. Muma
 John Jay Naugle
 Mrs. George Nebolsine
 Miss Barbara Neiderman
 Walter Nestel
 Roy R. Neuberger
 Mrs. Theodore W. Neumann, Jr.
 Arthur L. Newton
 F. W. Nitardy
 Mrs. Frank R. Oastler
 Kenneth O'Brien
 Mrs. Herman Oelrichs
 Professor Marcus C. Old
 Mrs. Clarence E. Olmsted
 Robert G. Olmsted
 Mrs. Dean C. Osborne
 Mrs. Harold S. Osborne
 Miss Mary Otter
 J. McKee Owen
 Arthur W. Packard
 Robert G. Page
 Henry Parish, II
 Dr. Herbert Parsons
 Mrs. Joseph Parsons
 Dr. R. Townley Paton
 Miss Amelia Peabody
 Dr. Louise M. Perry
 Henry A. Pfarrer
 Ansel Phelps
 Dudley L. Pickman, Jr.
 Theodore B. Pitman
 A. J. Pizzini
 Mrs. Walter S. Poor
 Mrs. S. Felton Posey
 Mrs. Frederic R. Pratt
 Richardson Pratt
 Sherman Pratt
 Frank J. Price
 Miss Mary Lyle Price
 Lloyd Ramsey
 Mrs. Frances F. Randolph
 George H. Reaney
 Mrs. Henry S. Redmond
 Carl S. Reed
 William Reydel
 Mrs. Lloyd Richards
 Francis Behn Riggs
 Dr. Henry Alsop Riley
 Alexander F. Robb
 Ansel W. Robison
 Mrs. John Rogers, Jr.
 Saul M. Rosenfeld
 David Rosengarten
 Hollis T. Ross
 Philip L. Ross
 Max J. H. Rossbach

Mrs. Sigmund Rothschild
 Mrs. John Rutherford
 Mrs. John J. Ryan, Jr.
 Mrs. Walter J. Salmon
 Miss Katherine A. Sargent
 Porter Sargent
 Herman Sartorius
 Mr. and Mrs. Theodore F. Savage
 Mrs. J. Louis Schaefer
 Jacob R. Schiff
 Harvey L. Schwamm
 William R. Scott
 Master Charles T. Scribner
 Miss Antoinette Scudder
 Mrs. Philip S. Sears
 Mr. and Mrs. Leo Seligman
 E. E. D. Shaffer
 William H. Sheffield, 3rd
 James Sheldon
 Miss Mona Shelley
 William A. Sleeper
 Anthony Smart
 Mrs. Bostwick Smith
 Thomas L. Smith
 Otto L. Spaeth
 David Swing Starring, Jr.
 John Steinbeck
 Samuel C. Steinhardt
 B. Albert Stern, Jr.
 Emil Stern
 Mrs. Gordon Stevenson
 Miss Charlotte R. Stillman
 Mrs. Ernest G. Stillman
 John S. Strauss
 S. R. Swenson
 Mrs. H. Clinch Tate
 Mrs. Carl Taylor
 Mrs. Thomas D. Thacher
 D. G. Brinton Thompson
 Earle S. Thompson
 Mr. and Mrs. Paul Tison
 Miss Emily Tobias
 Prentice W. Towsley
 Mrs. Alfred M. Tozzer
 Frank Treuting
 Frank E. Troiano
 Howard A. Van Vleck
 William H. Von Bergen
 Miss Amelia Von Nagy
 Mrs. S. F. Voorhees
 Pfc. Carl Vretta
 Mrs. Seymour Wadsworth
 Lawrence H. Walkinshaw
 Miss Hannah B. Walsh
 James A. Walsh
 Mrs. Felix M. Warburg
 Dr. Jerome P. Webster
 Dr. Henry L. Weil
 John S. Williams
 Samuel D. Williams
 J. Albert Wolfe
 Henry J. Wolff
 Mrs. Willis D. Wood
 Cedric R. Woodward
 Christian A. Zabriskie

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

Aid for Our Cancer Research

As members of the Zoological Society have been informed from time to time, a member of our staff, Dr. Myron Gordon, Assistant Curator of the Aquarium, has been pursuing an important line of research on the genetics of cancer in fishes.

We have now been informed that the National Advisory Cancer Council, a division of the U. S. Public Health Service, has made a grant of \$8,600 to further this work, beginning July 1, 1947.

As far back as 1939 the Zoological Society began to support Dr. Gordon's research on the inheritance of pigment cell growth in certain small Mexican fishes. Some malignant human cancers are melanomas, or black tumors, and their counterparts are found in hybrid fishes that Dr. Gordon has developed. Obviously, a study of the production of these pigmented tumors in fish may throw light on their appearance in human beings.

The Zoological Society will continue its financial aid to Dr. Gordon's research. He has been assisted since 1940 by the Anna Fuller Fund, and is at present supported by the Zoological Society and the American Cancer Society.

A Giant Panda Is Promised

Shortly after word was received here in October that a young Giant Panda had been captured for the New York Zoological Society, a cable from China informed us that the animal had died in Shanghai from acute dysentery.

General Chang Chun, governor of Szechuan Province, has already expressed the desire to present another specimen to the Zoological Society.

Crime Pays — the Aquarium!

The Electric Eel research of the New York Aquarium has received help from many sources in the past few years, but never from such an unlikely source as the Police Department until

recently when the police confiscated a large number of pin-ball games.

These gambling devices contain complicated electrical apparatus — small motors, relays and the like. Much of this mechanism can be used in laboratory circuits set up to test the electrical powers of the Electric Eel, and Curator Coates has been permitted to select items that the Aquarium staff can use.

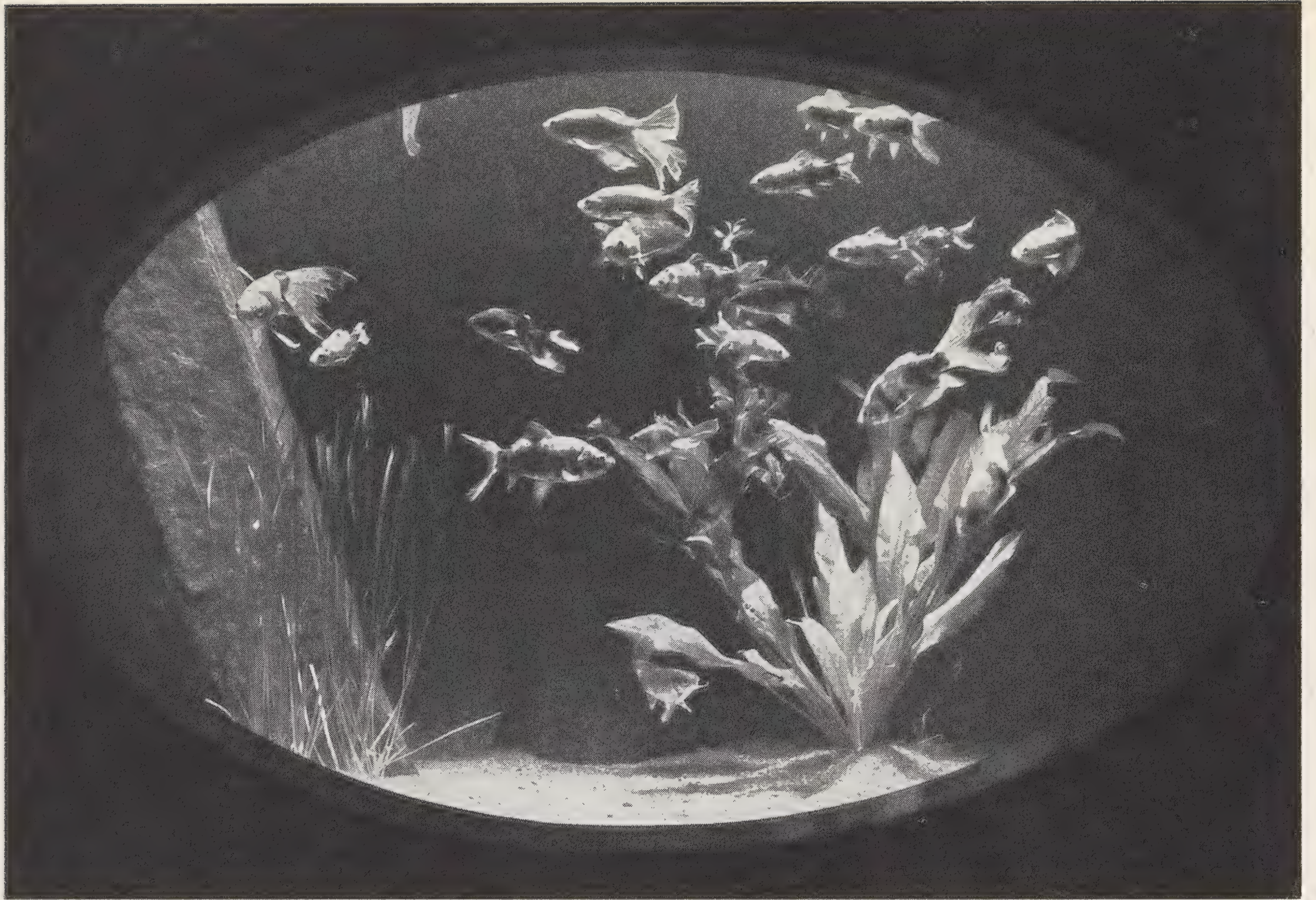
Visitors from Four Countries

Within the past month scientists from four countries have visited the Aquarium to discuss specific problems with members of the staff. They included Dr. K. N. Bahl, professor of zoology of the University of Lucknow to talk about methods of studying bio-physical phenomena; Dr. A. H. Gohar, director of the Marine Biological Station at Ghardaga, Egypt, who wanted advice on a new Aquarium and marine exhibit at Suez; the Rev. Father Langan, S.J., to discuss the way of setting up a small Aquarium in Ceylon to study fish behavior; and Dr. J. H. Means, Jackson professor of clinical medicine at Harvard University, who is interested in a proposed symposium on the thyroid glands and thyroid diseases in fishes.

Two Records

Both the Children's Zoo and Question House closed for the season on November 11 — and both established new high marks for the number of visitors. It was, of course, the first full summer for Question House.

The Children's Zoo had 325,000 visitors as against 238,000 last year, and Question House drew the amazing number of 72,133 persons who asked 9,537 questions! It speaks well for the competence of the staff that all but 214 of these could be answered immediately, while the inquirer was at the question desk. The 214 "stumpers" required research and were answered by mail.



EXTRAORDINARILY BRILLIANT AND DRAMATIC EFFECTS ARE OBTAINED WITH THIS NEW EXHIBITION TANK DEVELOPED IN THE NEW YORK AQUARIUM. IT GIVES AN ILLUSION OF GREAT DEPTH.

PUBLICATIONS OF INTEREST

AUDUBON BIRD GUIDE. Eastern Land Birds. By Richard H. Pough. Colored illustrations by Don Eckelberry. Sponsored by National Audubon Society. Published by Doubleday & Co., Inc., 1946. Price \$3.

Constantly increasing interest in birds afield brings a growing demand for ready means of identification. This pressure has resulted in a succession of "field books," each a little better than the last. The present work maintains the rate of progress well, for it is definitely the best that has so far been produced.

The scope is somewhat broader than that of most similar books, extending westward to the limits of the tall-grass prairie country. This admits the inclusion of many birds not usually thought of as "eastern." There is an informative foreword containing condensed factual material of great value. Under each species heading are brief paragraphs devoted to points of identifica-

tion, voice, nest, range and best of all, habits.

A single feature presents itself for criticism and that is the treatment of species only, with studied omission of forms. This is a strongly controversial point, with a great array of arguments on either side. Dick Pough is an able field man and since he has chosen his course knowingly, probably we should not be too critical. But what will the advancing student think when he finds that there is no bird known as the "Common Crow" by anyone but Mr. Pough and that actually the term has been invented to cover a group of forms well known as the Eastern Crow, the Southern Crow and the Florida Crow? Will he be satisfied when he reads, on p. XVII of the introduction, ". . . that many species are now being subdivided geographically into subspecies or races"?

The colored plates done by Don Eckelberry are adequate and make one of the book's most useful features. They are fully diagnostic and the reproduction is excellent. — LEE S. CRANDALL

INDEX

Figures in **black type** indicate that the reference is, or includes, an illustration, map or design.

A

Addax, **166**
 African Plains, **52, 103**
 'American Flamingoes at Home,' painting, **44**
 Animal Art, exhibit of, **156**
 Aquarium, new tank, **218**
 sketch of new, **51**
 visitors to, **217**
 Aquarium, New York, early collecting wagon, **13**
 early view, **12**
 history of, **11**
 model of new building, **14**
 recent view, **13**
 Art Collection, Zoological Society, **43**
 Atomic bomb, **58, 59**
 "Audubon Bird Guide," reviewed, **218**
 Aviary, planted, **50**

B

Bartlett, Captain "Bob," **117**
 Bats, **98, 99**
 Bear, "Blue," **127, 154**
 Beebe, William, "With a Roving Commission," **18**
 "The Great Gray Frog of Rancho Grande," **193**
 Beetle, Cloaked Knotty-horn, **140**
 Hercules, **Cover No. 5, 167**
 Bikini Atoll, map of, **58**
 "Bird Housekeeping," **177**
 Bison, American, **23**
 shipping, **32**
 Blandy, Vice-Admiral W.H.P., letter to Fairfield Osborn, **59**
 Blatchley, Myrtice, "Telling the World," **38**
 Bobcat, **135**
Bodianus fulvus, **25**
 Bostelmann, Elsie, **27**
 Bounty System, **130**
 Boxfish, Spiny, **65, 66**
 Bridges, William, "Into Some Queer Corners," **35**
 "Reading and Writing," **42**
 "The Electric Eel Went to War," **73**
 "The Sentimental Approach," **104**
 "Around the Zoo with the Head-keeper of Mammals," **113**
 "The Belgian Congo's Gift to the New York Zoological Society," **158**
 "The Last of a Species," **183**
 "How to Weigh a Gorilla," **200**

review of "Man-eaters of Kumaon," **86**

C

Cadwalader, John L., **49**
 Cancer Research, **217**
 Carlisle, Donald T., "This Is the Way We Began," **8**
 "Petunia and Jeffrey Visit School," **79**
 "That's What We're Here For!" **82**
 "An Open Letter to Our Members," **146**
 "An Expedition Your Friends Will Wish to Join," **181**
 "Trustees of Friendship," **191**
 Carnegie, Andrew, **38**
 Caverns, Carlsbad, **98**
Ceratophrys dorsata, **28**
 Chapin, Cornelia Van A., "An Artist Looks at the Zoo," **149**
 Children's Zoo, **48, 104-107, 117**
 1946 attendance, **217**
 Christensen, Ernst, "The Bats of Carlsbad Caverns," **98**
 Clark, H. Huber, photo by,
 Chun, General Chang, **217**
 Cover No. 3
 Coates, Christopher W., **73**
 "Life of the Waters," **11**
 "Pumps Are a Problem, Too," **111**
 "Tiny Killers," **152**
 Cobra, Indian, **134**
 King, death of, **154**
 Coney, **25**
 Conservation, need for, **76**
 New exhibit, **117**
 of Chautauqua Muskellunge, **204**
 "Outdoor Life" contest, **118**
 planned exhibit, **34**
 Zoological Society's activities in, **31**
 Coyote, **135**
 Crandall, Lee S., "Fun in the Zoo," **46**
 "Bringing Up Benny," **61**
 "The Carefree Life of a Baby Gibbon," **70**
 "A Curious Display Form of a Curious Bird," **109**
 "New Animals Are Coming to the Zoo," **122**
 "Five Ways of Obtaining Animals," **165**
 review of "The Lost Woods," **86**
 "The Dinosaur Book," **88**
 "Mammals of Nevada," **188**

"Audubon Bird Guide," **218**

Crane, Wattled, **95-97**

D

Dauchy, Ruth, **79**
 Deer, White-tailed, bottle on foot, **154**
 Diisopropyl fluorophosphate, **73**
 "Dinosaur Book, The" reviewed, **88**
 Ditmars, Dr. Raymond L., **36**
 Ducks, killed by pollution, **56, 57**
 Dunton, Sam, **120**

E

East, Ben, "Lord of the Northern Trails," **171**
 "Fish Do Come Back," **204**
 Eddy, Brayton, "Newcomers from the Gold Coast," **68**
 "Giants In Armor," **91**
 "Camera Close Ups," **139**
 Education, school class, **40**
 work of Zoological Society, **38**
 Eel, Electric, **216**
 diagrams of, **74, 75**
 in war research, **73**
 method of handling, **85**
 Elephants, African, **158, 161-164, 190, 192**
 presentation of, **191**
 Elk, Roosevelt, **7**
Epimachus m. meyeri, **108-110**
 Expedition, New Guinea, **35**
 Trinidad, **36**
 Tropical Research, **37**

F

Farm-in-the-Zoo, **48**
 First Aid, station in Zoo, **155**
 Fish, killed by pollution, **54**
 Fishes, color changes in, **25**
 deep-sea, **27**
 Fontainebleau, Biological Reserve, **86**
 Forest, burnt-over, **78**
 White River National, **77**
 Forrestal, James, letter to Fairfield Osborn, **59**
 Fox, **132**
 Frog, Brazilian Horned, **28**
 marsupial, **Cover No. 6, 193, 195-197, 199**
 Paradox, **36**
 Fuertes, Louis Agassiz, **44**

G

Gabrielson, Ira N., "It Was Rugged for Wildlife, Too," **55**
 Game Hogs, **31**
 Gayal, **122**

Gecko, House, **128**
 Gibbon, baby, **70**
 "Junior," white-handed, 188
 Giraffes, **Cover No. 2**
 "Jill," new, **168, 169**
 Gopher, Striped, **136**
 Gordon, Myron, "Footnote to Darwin," 65, 217
 Gorilla, "Makoko," **202**
 "Oka," **200-203**
 Goss, Leonard J., "Roads to Research," 15
 "A Rare Bird Walks Again," 95
 Grant, Madison, **9**
 Gregg, Alan, "An M.D. Looks at Conservation—and the Zoological Society," 76
 Grison, **127**
 Guanaco, **170**

H

Hamilton, W. J., Jr., "The Bounty System Doesn't Work," 130
 Heads and Horns, national collection, 45
 Hippopotamus, "Pete," weighing, 155
 Hornaday, William Temple, **10**

J

Jackson Hole, 7, **33**
 Jennen, Joseph, 191
 Jewel Room, **50, 51**

K

Kartabo, Tropical Research Station at, **37**
 Krait, Banded, **129**
 Kurth, Herbert, 30

L

Labels, cage, **51**
 Lemur, **165**
 Leopard, Snow, **118**
 Lion, **Cover No. 3**
 Lizard, Texas Horned, **143**

 Zonure Spiny, **69**

"Lost World, The," reviewed, 86

M

Macaw, Hyacinthine, **Cover No. 4**
 Mammalogists, American Society of, 118
 "Mammals of Nevada," reviewed, 188
 "Man-eaters of Kumaon," reviewed, 86
 Merkel, Hermann, 211
 Millipede, **139**
 Moose, **171, 173-175**
 Morton, Levi P., **41**
 Moses, Park Commissioner Robert, 191
 Moth, Promethea, **141**
 Murals, Question House, **144, 145**
 Muskellunge, Chautauqua, **204-207, 209**

N

Nigrelli, Dr. Ross F., 65

Niles, William White, **34**
 Nyala, **103**

O

Omosudis lowii, **27**
Oodinium, 66, **67**
 Orang-utan, death of "Mike," 154
 Osborn, Fairfield, **6**
 Editorial, "The Urgency of Conservation Education," 53
 "Going National," 89
 "Foreign Governments Are Helping," 121
 "Man and the Biological Scheme," 157
 "Opportunities Are Increasing in Research," 189
 "Half Centuries," 4
 "Conservation of Wildlife," 31
 "New Ways to Old Ends," 49
 leads Wildlife Conference, 86
 letter to Secretary of the Navy, 59
 speaks in mid-west, 84
 Osborn, Henry Fairfield, **9**
 Owl, Long-eared, **131**

P

Panda, Giant, death in China, 217
 Paradise, Long-tailed Bird of, **108-110**
 Prince Rudolph's Blue, **30**
 "Petunia," Skunk, **79-81**
 Pheasant, Malay Bronze-tailed
 Peacock, **24**
 Pigeon, Passenger, 183
 Pin-ball mechanism, gift to Aquarium, 216
 Piranha, **153**
 Pope, Clifford H., 85
Pseudis paradoxis, **36**
 Publications, Zoological Society, 42
 Pumps, Aquarium, 111, **112**
 Pyne, Percy R., **45**

Q

Question House, **39, 117, 144, 145**
 1946 Visitors to, 217

R

Radio, Broadcast in Zoo, **147**
 in the Zoo, **39**
 Rattlesnake, Florida, **134**
 Riding Animals, Zoological Park, **47**
 Rungius, Carl, painting by, **23**
 Ryckmans, Governor General, 191

S

Schilling, Gus, **113-116**
 Scorpion, baby, **127**
 Whip, **187**
 Scott, George, **177-180**
 Sculpture, by Cornelia Van A. Chapin, **149-151**
 Sealion, "Benny," 155
 and mother, **61-64**
 Shoebill, "Jimmy," death of, 85
 Silvercruys, Baron, 191

Simon, James, 188
 Skene, George, **213**
 retirement of, 187
 "42½ Years of Gardening in the Zoological Park," 211
 Sloth, Two-toed, **124, 125**
 Slug, **139**
 Snake, Blotchy Tree, **68**
 Coral, **134**
 Scarlet King, **134**
 "Snakes of the Northeastern United States," 85
 Spaak, Dr. Paul-Henri, 191
 Spider, Black Widow, **142**
 "Stork," letter to, 86
 Sutton, George M., 29

T

Tayra, **126**
 Teale, Edwin Way, 86
 Tee-Van, Helen, 28
 Tee-Van, John, "In the Medium of Oils," 43
 "An Approach Through the Sportsman," 45
 speaks in mid-west, 84
 Television, tests in the Zoo, **87**
 Thorne, Samuel, **41**
 Tigers, weight of cubs, 85
 Tortoise, Galápagos, **90, 92-94**
 Townsend, Charles Haskins, **12**
 Tragopan, Temminck's, **26**
 Tropical Research, History of Department, 18
 Laboratory, **19**
 46th Expedition, 86
 Tuberculosis, X-ray Campaign, 154

V

Vinegar Roan, **187**
 Viper, Russell's, **129**

W

Walcott, Hon. Frederic C., **6**
 "What's New at the Zoo?" **39**
 Wildlife Conference, North American, 86
 Wolf, **136**
 Timber, **133**
 Woodpecker, Ivory-billed, **29**

Z

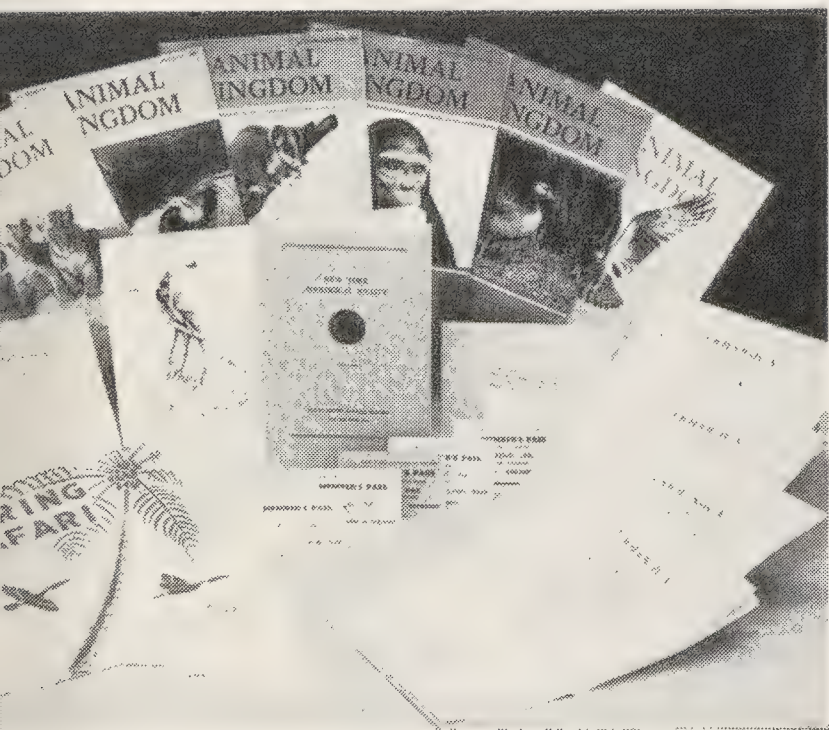
Zoological Park, Boston Road Gate in 1908, **212**
 Guide Book, 85
 Laboratory of Veterinarian, **16, 17**
 modernization of, 84
 old map of, **Cover No. 1**
 opening day, **8**
 program for opening day, **11**
 sketch of aviary, **10**
 sketch of Monkey House, **18**
 veterinary department, 15
 Zoological Society, Annual Meeting, **2, 3, 5, 6**
 early history, 8
 members, **2, 3**
 post-war program, 6

Make This Unusual Christmas Gift That Lasts Throughout the Year

—A membership in the New York Zoological Society!

Many entertaining special events at the Park! Magazines packed with accurate words and pictures about the world's rarest living animals! A technical quarterly for the serious biologist! Passes to all pay events in the Park — Children's Zoo, Farm-in-the-Zoo, animal rides and tractor trains. Guided tours by appointment.

What gift could be more welcome for anyone interested in the world of Nature?



MEMBERS RECEIVE ALL THESE

Send in gift memberships at once so that the full program of the Society for 1947 may be enjoyed. Just mail in names, addresses and dues to the Membership Office. An appropriate notice of your gift will be sent in time for the Christmas stocking. No shopping. No wrapping.

MEMBERSHIP COMMITTEE
New York Zoological Society
630 Fifth Avenue
New York 20, New York

moore



SMITHSONIAN INSTITUTION LIBRARIES



3 9088 01261 4574